Vol. 132, No. 6 June, 1930 Price 25 cents

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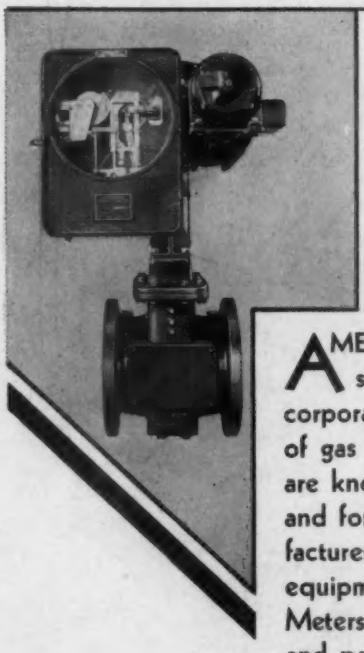
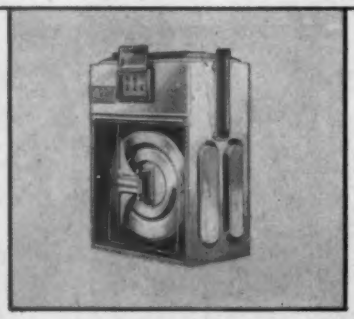
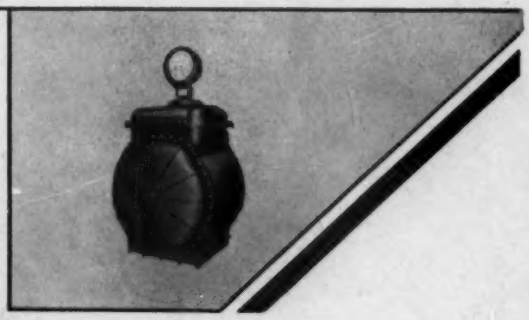
AMERICAN
GAS JOURNAL
Established 1859 Pioneer of the Gas Industry
Including · GAS INDUSTRY · Est. 1900 ·

Many Activities, A Single Objective···· Your Satisfaction

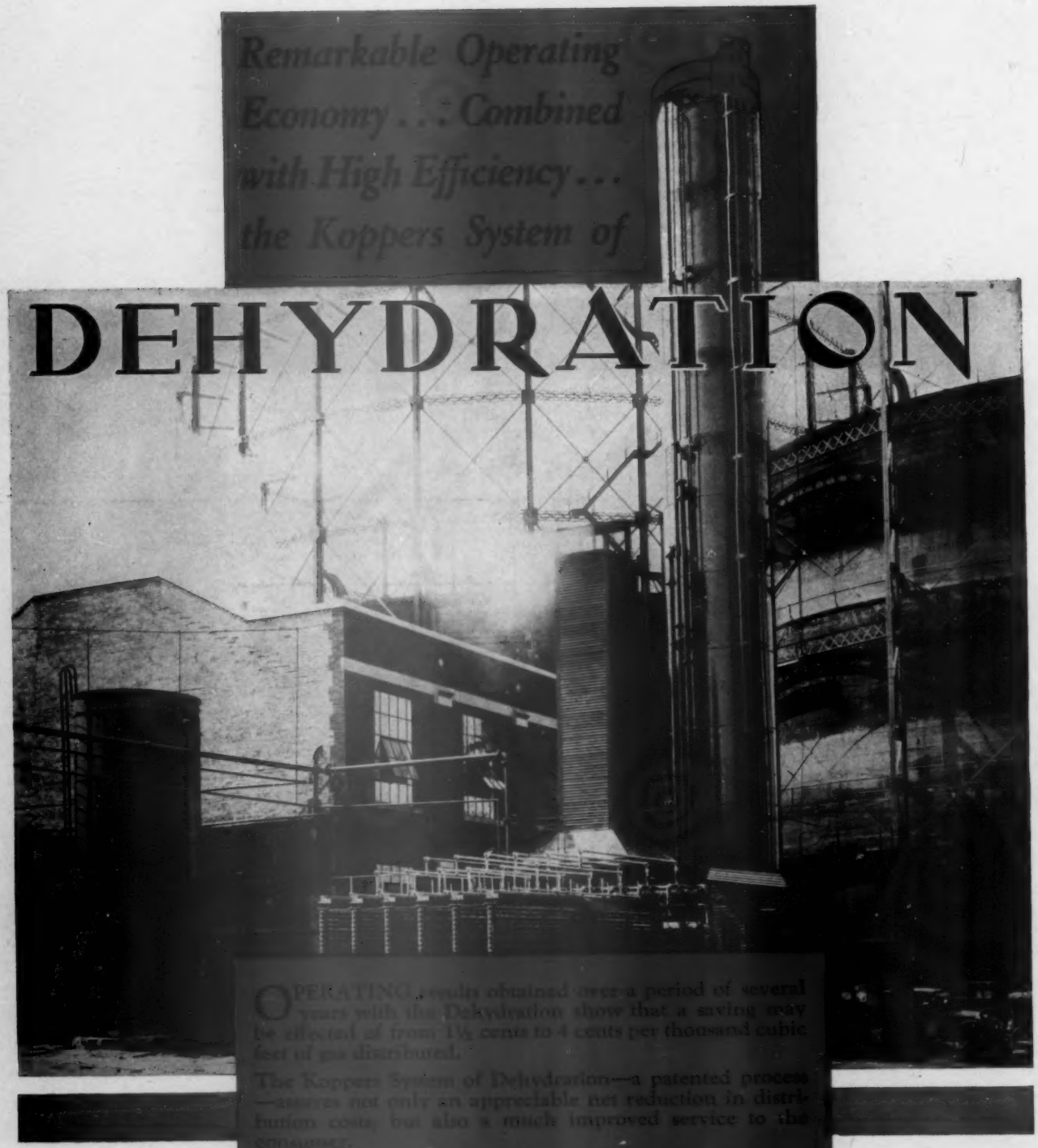






AMERICAN METER COMPANY is an engineering and service organization as well as a meter manufacturing corporation . . . This Company maintains an experienced staff of gas measurement engineers. It supports laboratories that are known for completeness and precision of equipment, and for tangible results obtained. It develops and manufactures gas and meter testing apparatus that is standard equipment in laboratories . . . American Meter Company Gas Meters are the result of long experience, practical research and painstaking manufacture. Their serviceability and accuracy makes them economical to use . . . An outline of the complete information furnished by American Meter Company service on the various requirements of gas measurement engineering will be sent on request.

AMERICAN METER COMPANY
Incorporated
General Offices: 105 West 40th St., New York, New York



OPERATING results obtained over a period of several years with the Dehydration show that a saving may be effected of from 1½ cents to 4 cents per thousand cubic feet of gas distributed.

The Koppers System of Dehydration—a patented process—assures not only an appreciable net reduction in distribution costs, but also a much improved service to the consumer.

To assist you in a survey of your distribution conditions and costs "Western Gas" Engineers offer you their services to determine the possible savings which could be effected by gas dehydration.

The Western Gas Construction Company
Subsidiary of THE KOPPERS COMPANY
Fort Wayne, Indiana

"Western Gas" Designs and Builds

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GAS JOURNAL
Established 1859 *Pioneer of the Gas Industry*
Including GAS INDUSTRY Est. 1900

Executive and Editorial Offices, 53 Park Place, New York City

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AMERICAN GAS JOURNAL, June, 1930, Vol. 132, No. 6 Published monthly by American Gas Journal, Inc., at 34 Crystal St., East Stroudsburg, Pa. Executive, Editorial, and Business offices at 53 Park Place, New York, N. Y. Entered as second-class matter, October 17, 1928 at the postoffice of East Stroudsburg, Pa., under the Act of March 3, 1879.

Subscriptions $2.00 per year, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines; in Canada $3.00; foreign $4.00. Single copies 25 cents.

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Steel tanks, field assembled, of large diameter have been used for only a comparatively short time.

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High and Low Pressure Gas Holders to meet your requirements

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STACEY
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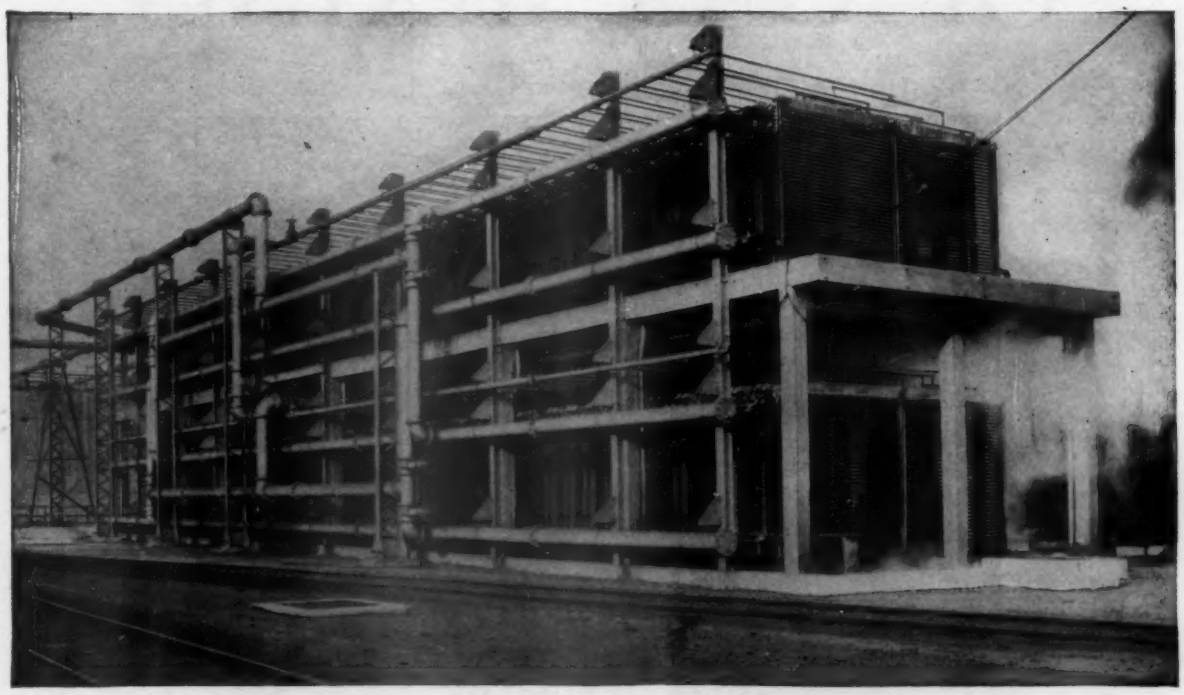
Semet-Solvay Built Cooling Coils Assure Long Service



A coke oven plant operates continuously. Equipment for handling the products it makes must be built for enduring service.

The 210 stacks of Cooling Coils illustrated are located on one of the largest steel plants in America. They have given uninterrupted service for four years and are good for a great many more.

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Our coils are designed to make maximum use of cooling water. Sherardizing protects them against corrosion. They are in service in all parts of the continent, resisting the chemical action of salt water from two oceans and many varieties of inland waters.

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Whatever you purchase from us—a cooling coil or a gas plant—you will find to be low in cost, simple in design and enduring in service.

SEMET-SOLVAY
ENGINEERING CORPORATION
Division Allied Chemical and Dye Corp.
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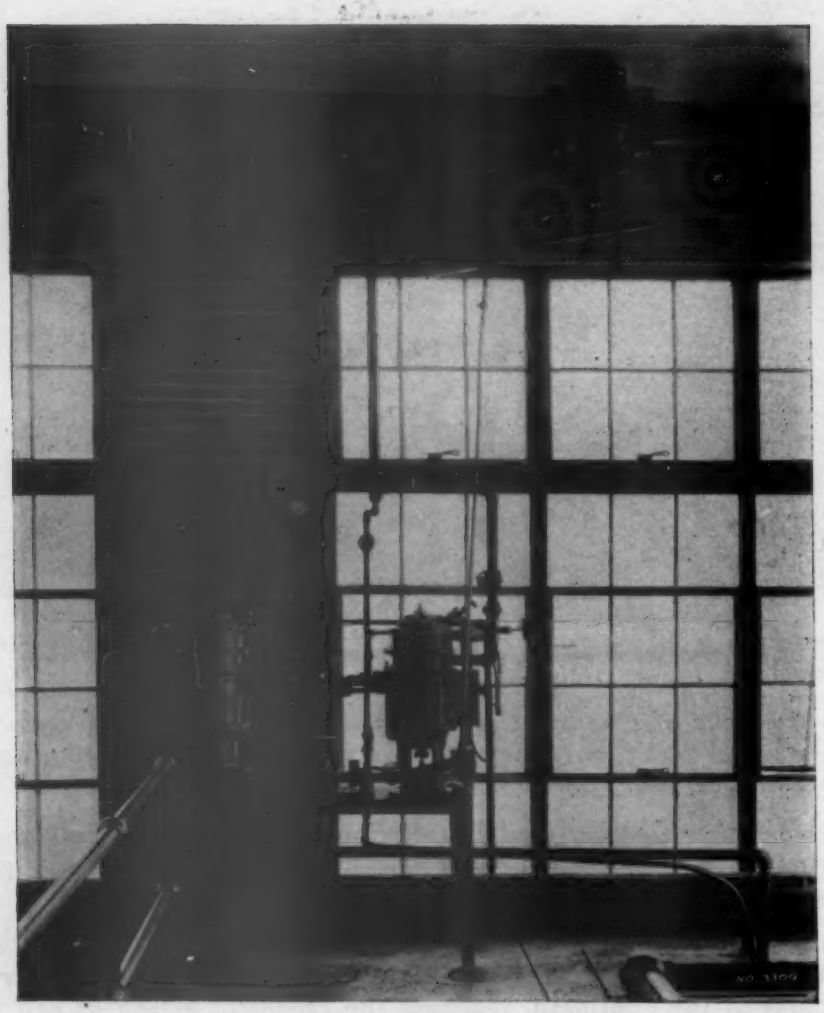
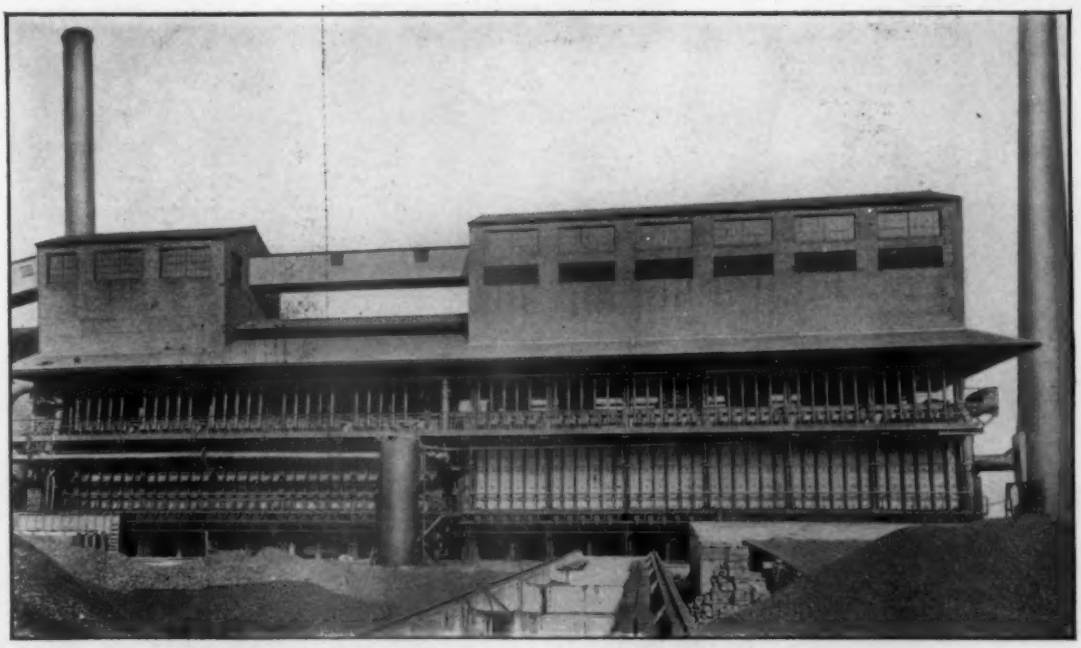
SMOOT CONTROL OF GAS MIXING



This Smoot Gas Mixing Control at the Binghamton Gas Works, Binghamton, N. Y., mixes manufactured gas with natural gas.

This control operates from the gas pressure and flow and therefore responds immediately to variations with no sampling or instrument time lag.

SMOOT ENGINEERING CORPORATION
136 Liberty Street New York



Now . . . 6,500,000 C. F.
daily capacity

U. G. I. Vertical Chamber Oven Plant *at Racine . . .*

IN 1928 we installed the first U. G. I. Vertical Chamber Oven unit, with a daily capacity of 3,000,000 c.f., at the Racine plant of the Wisconsin Gas & Electric Company.

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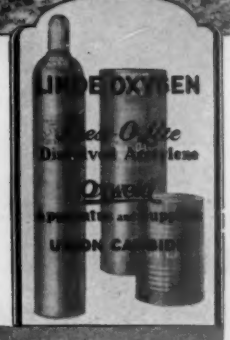

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. . . . . and offers invaluable assistance in organizing your welding operations for maximum speed and economy.

Step by step, from the mobilization, training, and testing of welders and the careful selection of equipment and supplies, it goes to the final testing of the line. Cooperating with your own engineers, it makes available to users of Linde Oxygen the facilities developed by years of experience on thousands of miles of pipe line.

It assures absolute tightness of the line with tough, ductile welds as strong and as permanent as the pipe itself.

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42 Apparatus Warehouse stocks . . . 245 Union Carbide Warehouse stocks

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LET us assume that you would like to know the benefits of a systematic analysis of your plant.

Well, here's our proposition: We do not want to pester you with either personal solicitation or correspondence—if we could meet and talk things over on the basis of mutual respect and confidence, we could get right down to the job of proving to you the benefit of a systematic analysis of your plant and of its value to you.

We have something more than mere construction service to offer you—everything you could expect from a competent, progressive engineering organization.

We are ready to serve—anxious to discuss your problems, whatever they may be—ready to take a keen interest and give you the benefit of more than twenty-five years' experience on designing, building and operating coal gas plants.

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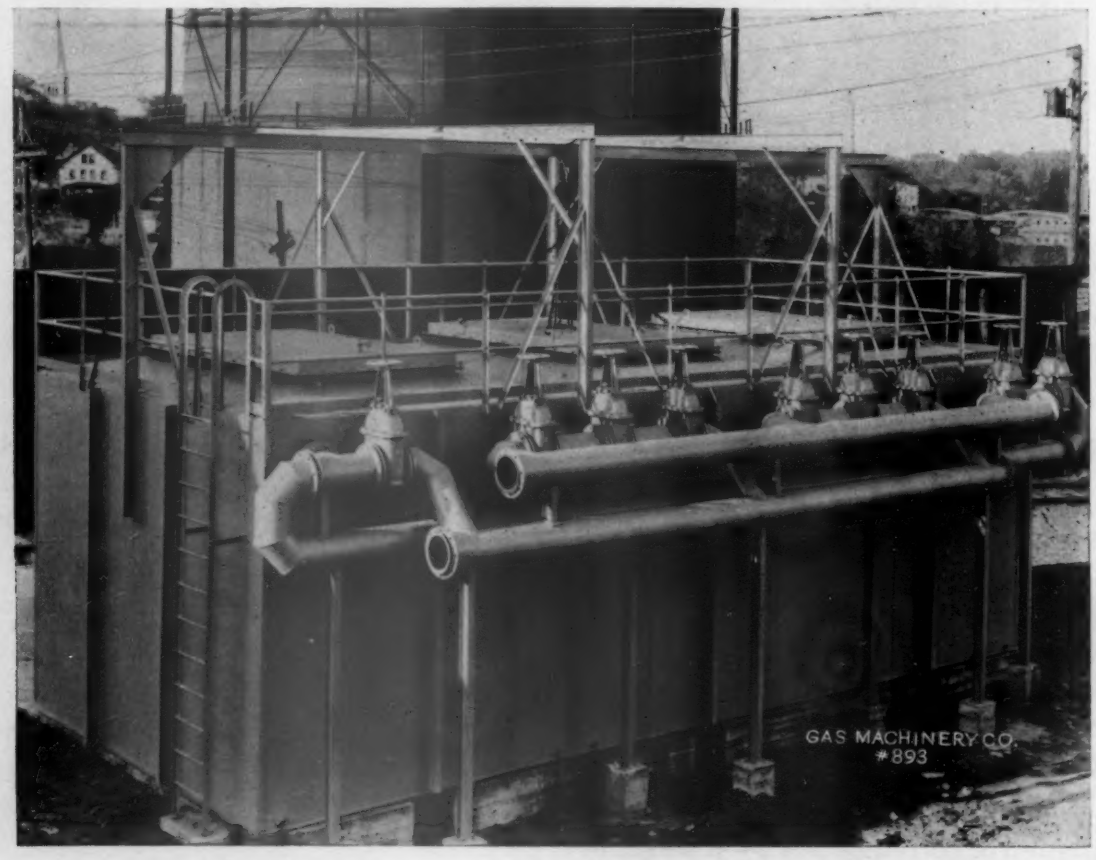
ENGINEERS NEW YORK — *BUILDERS* CHICAGO

ARC-WELDED STEEL PURIFIERS

Insure Low Investment Costs and Satisfactory and Efficient Removal of Sulphur



The purifiers shown in above halftone were recently completed for a rapidly growing eastern company.

The structure is divided by two partitions into three purifier boxes and the flow of gas is controlled by the valve manifold designed to permit the flow of gas thru the several compartments in the following rotation:

A, AB, ABC,
B, BA, BAC,
C, CA, CAB,

and any one section may be cut out for cleaning and filling.

The reinforcement of the top deck and the covers is all on the underneath side, thus insuring against pockets for water to lodge in and cause depreciation by rusting.

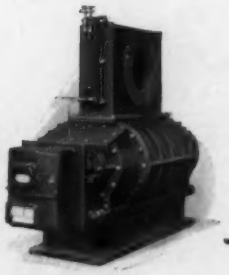
Unloading is facilitated by three self-sealing side doors, each 3′ 8″ wide x 11 high, (one in each compartment).

We shall be pleased to quote on your requirements.

THE GAS MACHINERY COMPANY

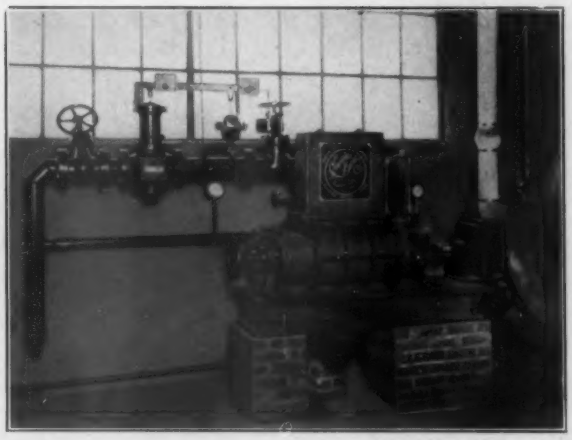
CLEVELAND, OHIO

Eastern Office: 812 Graybar Building, New York City



Accuracy, wide range, low differential, small space, low maintenance, dependable operation.

And now they have Connersville Meters with a total normal capacity of 1,000,000 cu. ft. per hr. on industrial consumer installations



The "X" Gas Company serves a large industrial community and, of course have been greatly interested in the problem of reliable meters for their large industrial consumers.

Knowing that Connersville Meters were already serving their manufacturing and distributing departments most satisfactorily, the engineers of this company placed a 12,000 cu. ft. per hr. Connersville Meter on a customer installation. In the three years since then, they have placed on industrial service many more Connersville Meters of different capacities, until now the total normal capacity of these Connersville Meters is approximately 1,000,000 cu. ft. of gas per hour. The engineers of the "X" Gas Company have learned that Connersville Meters are accurate, not only at a pre-tested rate of flow, but also over a wide range; that Connersville Meters do not require adjustment, the displacement being machined into cast iron surfaces; that the iron and steel construction means low maintenance costs; that the installation cost is small, even for the larger capacities; and that Connersville Meters operate on low differential pressures of 1″ or less.

These same features will be valuable to you also. The coupon below is convenient for requesting more information.

The name of the "X" Gas Company can be given upon personal request.

CONNERSVILLE
Blowers-Gas Pumps-Meters-Cycloidal Pumps

THE CONNERSVILLE BLOWER COMPANY, INC.
(Division of Stacey Engineering Co.)
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CONNERSVILLE, INDIANA

20 N. Wacker Drive, Chicago
420 Lexington Ave., New York

(Use coupon for convenience.)

Gentlemen: Please send me bulletins and other information about Connersville Meters for consumer service.

(Name) .....

(Company) .....

(Address) .....

(Mail to The Connersville Blower Co., Inc. Connersville, Indiana.

with maximum safety and economy

WHETHER the job is a long gas line through the country or a main under city streets, the prime requisite is dependability. Dependability when the service begins—dependability through the years.

Starting off with the right pipe is the surest way to lay a line that will remain sound and dependable from end to end. The right pipe has high tensile strength, sufficient ductility, accurately finished ends, good welding qualities, resistance to corrosion—and is available in double random lengths. Such pipe gives promise of maximum safety and economy through the years to come. NATIONAL Pipe is the right pipe. That is why gas companies rely so generally on NATIONAL dependability.

Remember, NATIONAL double random lengths cut the number of joints to about one-half . . . reduce the possibility of leakage . . . and mean a considerable saving in time, labor and joint-making materials—another reason why NATIONAL is—

AMERICA'S STANDARD WROUGHT PIPE

NATIONAL TUBE COMPANY • Pittsburgh, Pa.

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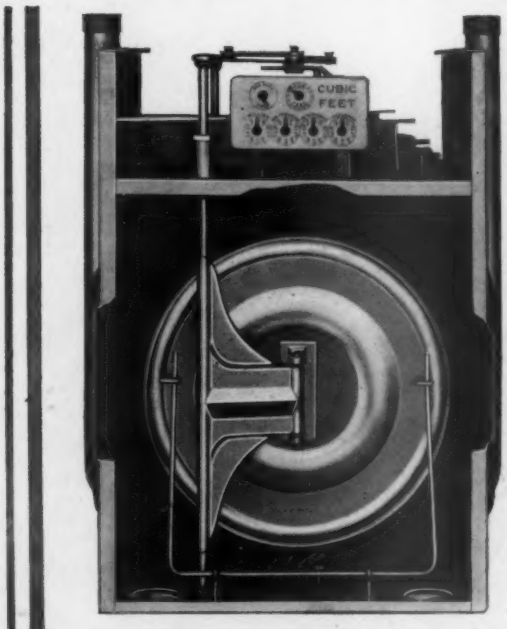
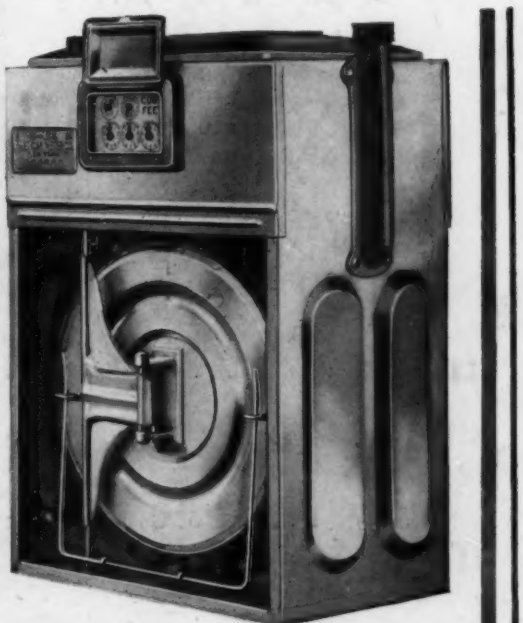
NATIONAL PIPE

Also C type meters (tinned steel case). Capacity range—600 to 17,500 cubic feet per hour. Six sizes.
Metric Iron Case Meters, Orifice Meters and Testing Apparatus



A type meters (tinned steel case). Rated capacity range—175 to 3400 cubic feet per hour at ½" differential. Five sizes.



B type meters (tinned steel case). Rated capacity range—150 to 7500 cubic feet per hour at ½" differential. Eight sizes.

Gas Meters that are not duplicated

AMERICAN METER COMPANY Gas Meters have every known requirement for true economy.

Collectively, these meters cover the entire range of Gas Company needs for measuring manufactured or natural gas. The line is complete. And the varying requirements of each section of the country are served by a manufacturing plant or a service station located in that area.

Individually, each meter has every quality necessary for accuracy and dependability—proper design and construction—proper metallurgical composition of parts—precise assembly—efficient operation.

Only an exact duplication of each feature in every detail can give an equivalent value.

High quality is true economy. American Meter Company Gas Meters will measure your Gas at lower cost. A nearby representative will be glad to discuss this with you.

AMERICAN METER COMPANY
INCORPORATED
The World's Largest Manufacturers of Gas Meters and Allied Apparatus
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GENERAL OFFICES : 105 W. 40TH STREET · NEW YORK, N.Y.

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Weather and Pressure

Sturdy Mueller Service Clamps meet either condition

Weather and pressure conditions can get very severe but no matter what they are, there is a Mueller Service Clamp for every gas or water service need.

Read these five advantages:

1. These clamps are malleable galvanized iron and are made in single and double strap pattern.
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5. All gaskets are molded with ears which are turned up over the edge of the clamps to hold gaskets in the proper position while the clamp is being placed on the main.

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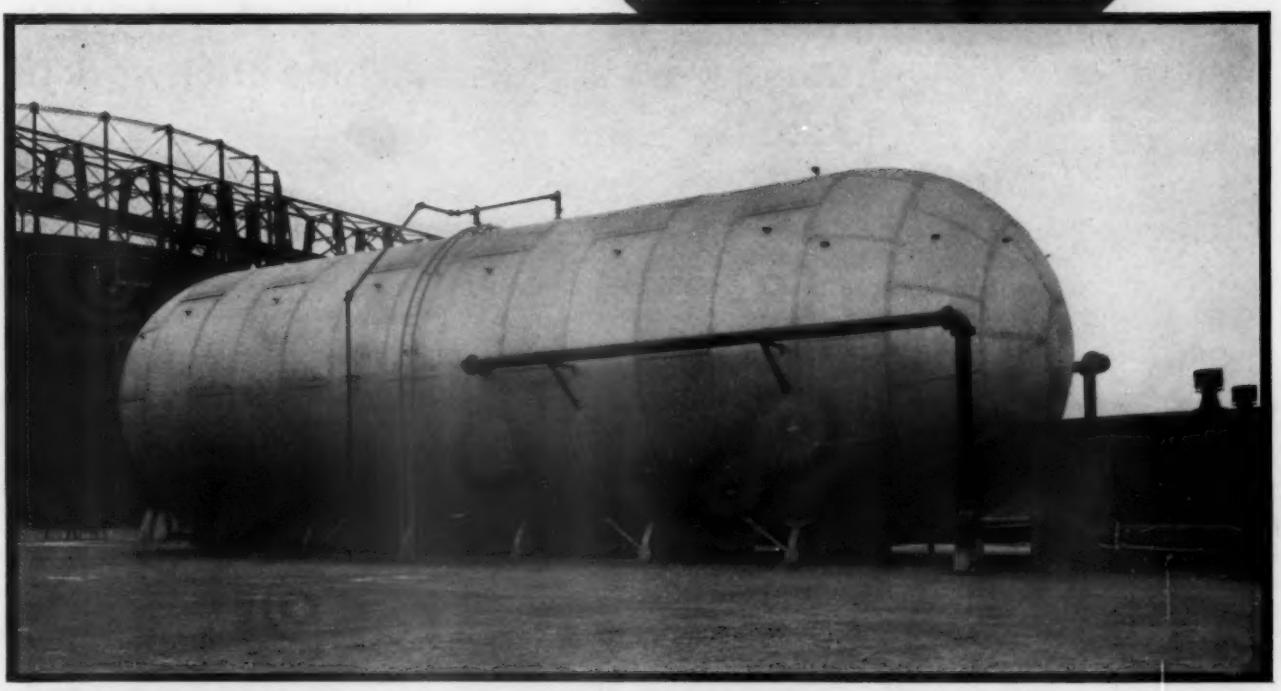
MUELLER CO., (Established 1857) Decatur, Illinois. *Branches:* New York, Dallas, Atlanta, San Francisco, Los Angeles, Chicago. *Canadian Factory:* MUELLER, Limited, Sarnia.

MUELLER

SMALL POINTS ••••●●

WILL LOOM
LARGE
●●●●●● IN THE YEARS
THIS HOLDER WILL SERVE



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AMBLER, PA.

Manufacturers of GAS HOLDERS and other major equipment for the GAS INDUSTRY

4500 HOURS

WITHOUT RE-LAYING BRICKWORK

Forty-five Hundred Average Hours operation with R & E #3000 Cement as against only 1500 average hours without—is something worth thinking about. That's the record of one of the country's largest gas plants—4500 average hours of operation without re-laying gas machine brickwork in the clinker zone.

Ask us more about R & E No. 3000 Refractory Cement—you'll be more than pleased by its performance.

REFRACTORY & ENGINEERING CORPORATION

Engineering & Manufacturing Specialists in High Temperature Cements.

50 Church St., New York, N. Y.

Warehouses in

Pittsburgh Baltimore Philadelphia Chicago

R & E # 3000

You can't find a better cement for all-around service in gas plants. R & E #3000 air-sets to full strength; retains its bond; makes brick dislodgement impossible when "barring down"; will not crumble. Unusual adhesiveness makes #3000 extremely efficient for hot or cold patching. Fine texture permits extremely thin joints which, together with its excellent bond, is a further safeguard against bricks "pulling out."

#3000 will not bloat or puff at low temperatures; does not crumble or fall when equipment is "off the line." Withstands temperatures in excess of 3000° F. Conveniently shipped ready for use in plastic form in 100 and 500 lb. steel drums. Try a drum today.

"Moldit"

We recommend Moldit for such work as monolithic floors, checker work and arches. It avoids delays in waiting for special tiles or brick. Just add a little fresh water and mold it into any desired shape.

Moldit "air-sets" and attains full strength without heat. It does not shrink and meets the most severe requirements of modern construction. You can use Moldit under temperatures up to 3000° F. It's easy to use, too. Add a little fresh water and pour—no ramming, no hammering—just mold it. Weighs only 100 lbs. molded. Shipped in convenient 100 lb. waterproof bags.

"Moldit-A"

Use Moldit-A for service under temperatures between 200° F. and 2400° F. It works the same as "Moldit" and can be used for monolithic floors, standpipes, doors, etc., any place where great structural strength is essential, or desired. Like other R & E Cements, Moldit-A air-sets and gains full strength without heat. It weighs approximately 100 lbs. per cubic foot and is shipped in 100 lb. handy waterproof bags.

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A New Heat Insulating Cement

for

Insulating Pipe Fittings
Ducts
Flanges
Water Heaters
Turbine Pumps
Coke Oven Doors
Coke Ovens
Regenerator Face Insulation
Between Brick Stays
Packing Around
Standpipes

Use it in place of asbestos cement and any place where a strong insulating cement is required. Sticks to cold surfaces as well as hot ones.

Keeping in Step
With The High Pressure Trend

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Sensing the trend to higher pressures, we present

CONNELLY
SERVICE GOVERNORS

(TYPE: D-C)

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District Governors
Service Governors
Compensator
Fuel Gas Governors
Gas Main Bags and Stoppers
Gas Testers
Jones Jet Photometer
Iron Sponge Precipitated

Connelly Governors are pioneers in the gas industry and are adaptable to every requirement of high and low pressures. Our bulletins describe them fully, our engineers will give many helpful suggestions if called upon.

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CONNELLY IRON SPONGE & GOVERNOR CO.

CHICAGO OFFICE and PLANT: 3154-3174 SOUTH CALIFORNIA AVE. **MAIN OFFICE and PLANT: ELIZABETH, N. J.**

There are 2 ways to buy valves—

Either on a basis of price or a basis of quality.

If price is your first consideration you cannot expect unfailing service or long life from your choice. But if you have given values proper thought and bought Darling quality—you can expect—and get the satisfactory performances for which Darlings are noted.

The Darling is a tight seating, easily operated, long wearing valve, built expressly for oil field work. Its best friends are those who have tried it out side by side with other makes and found that a Darling Gate Valve reduced production losses to a minimum, practically eliminated replacements and realized a genuine economy.

Diagrams of construction, showing how and why Darlings operate easily, shut tight, and outlast others, will be gladly sent on request.

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GATE VALVES

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48″ U. S. Cast Iron Pipe line rounding a curve in Chattahoochee Avenue, Atlanta, Georgia.

ooo

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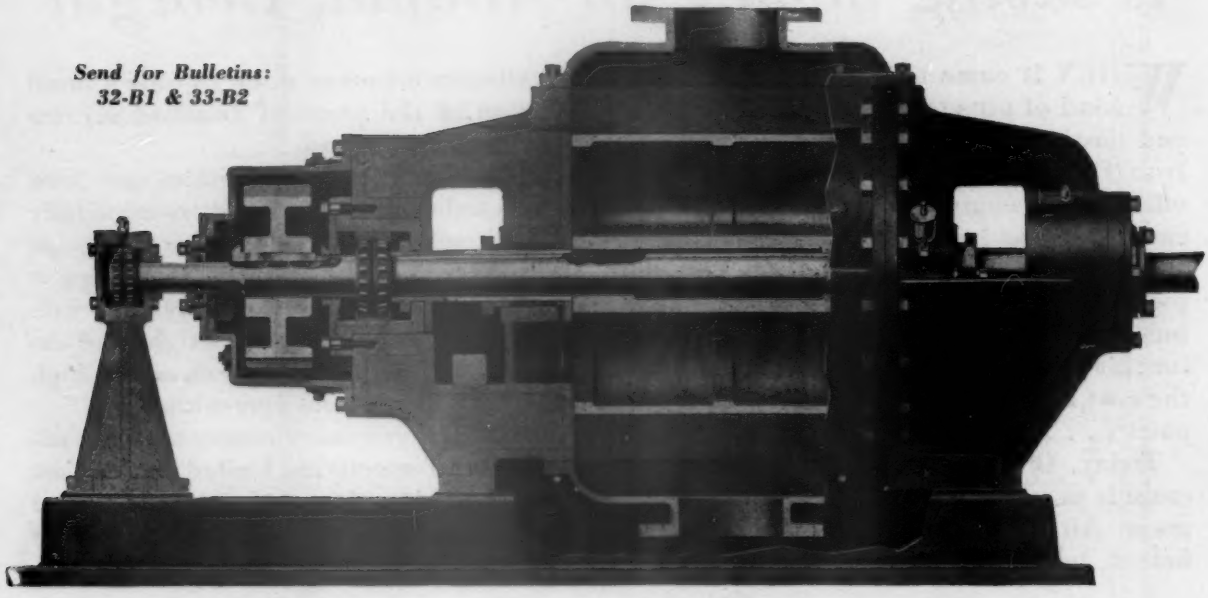

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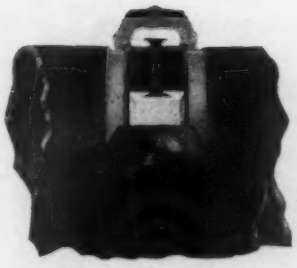

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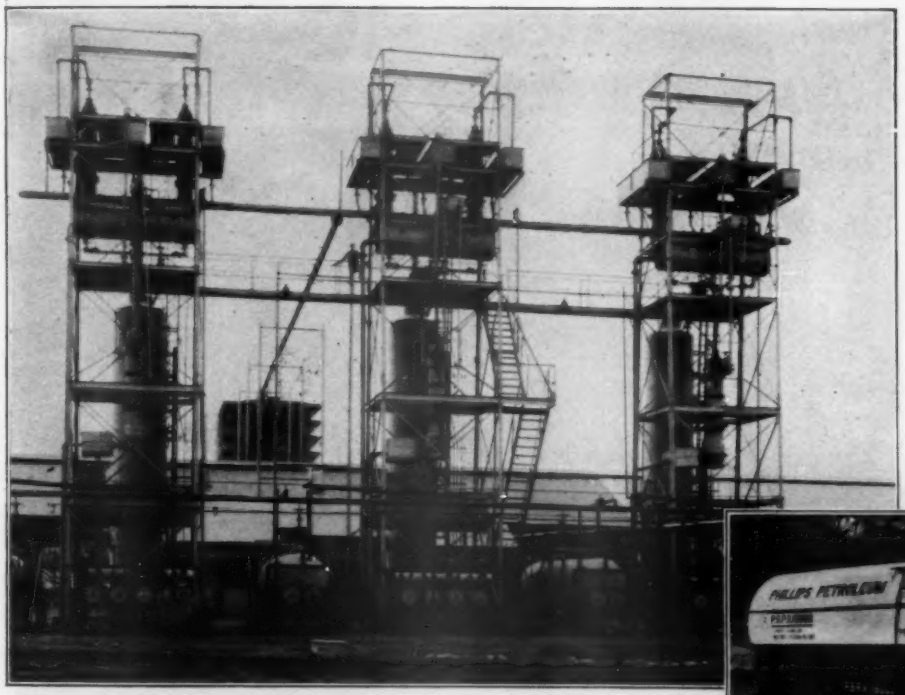

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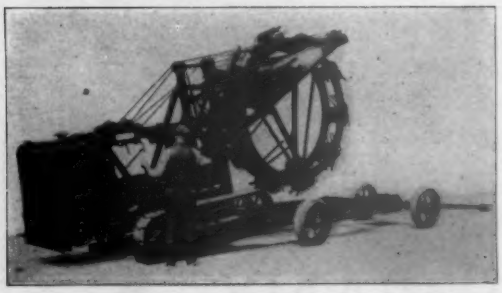

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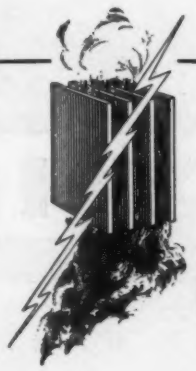

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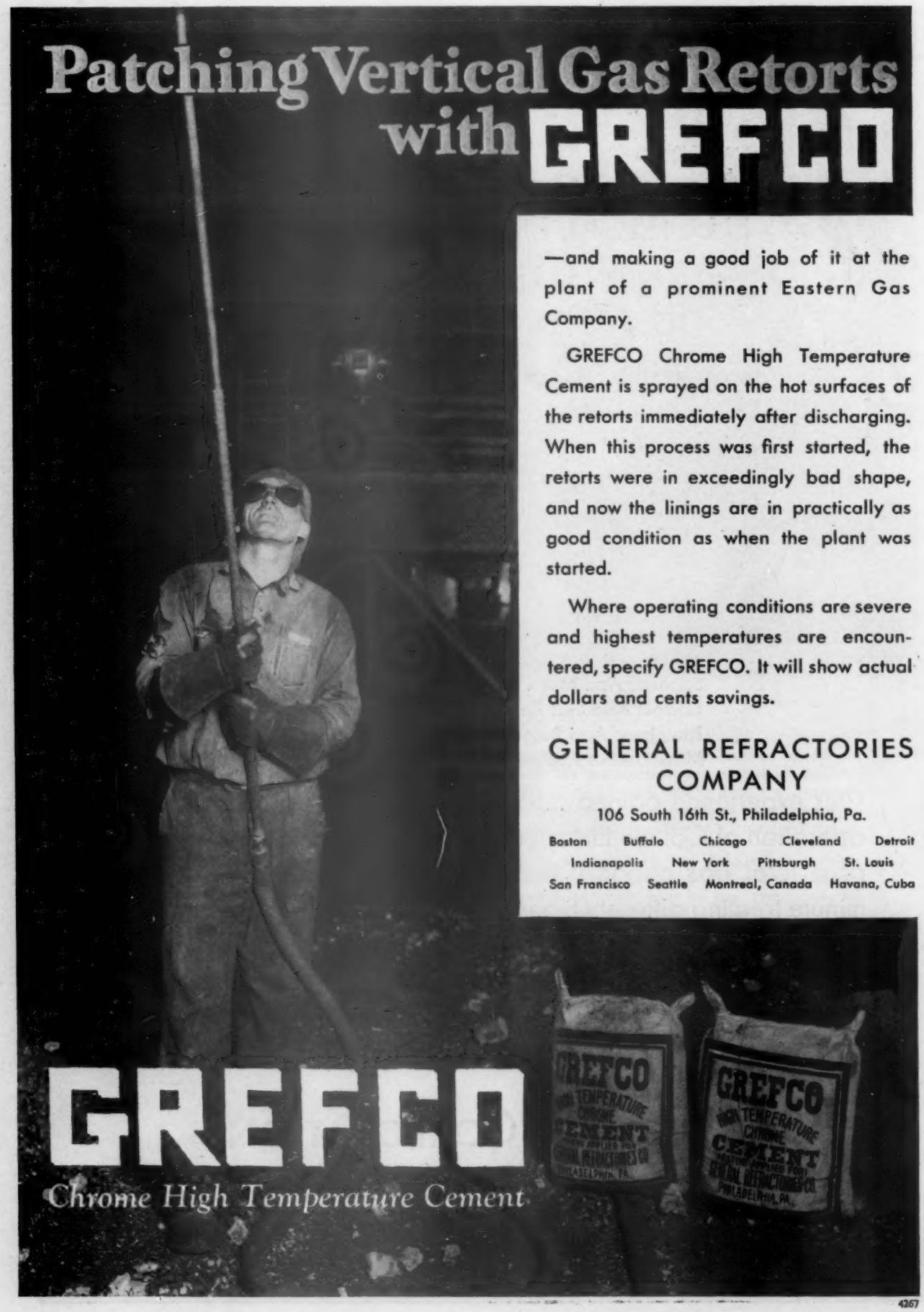

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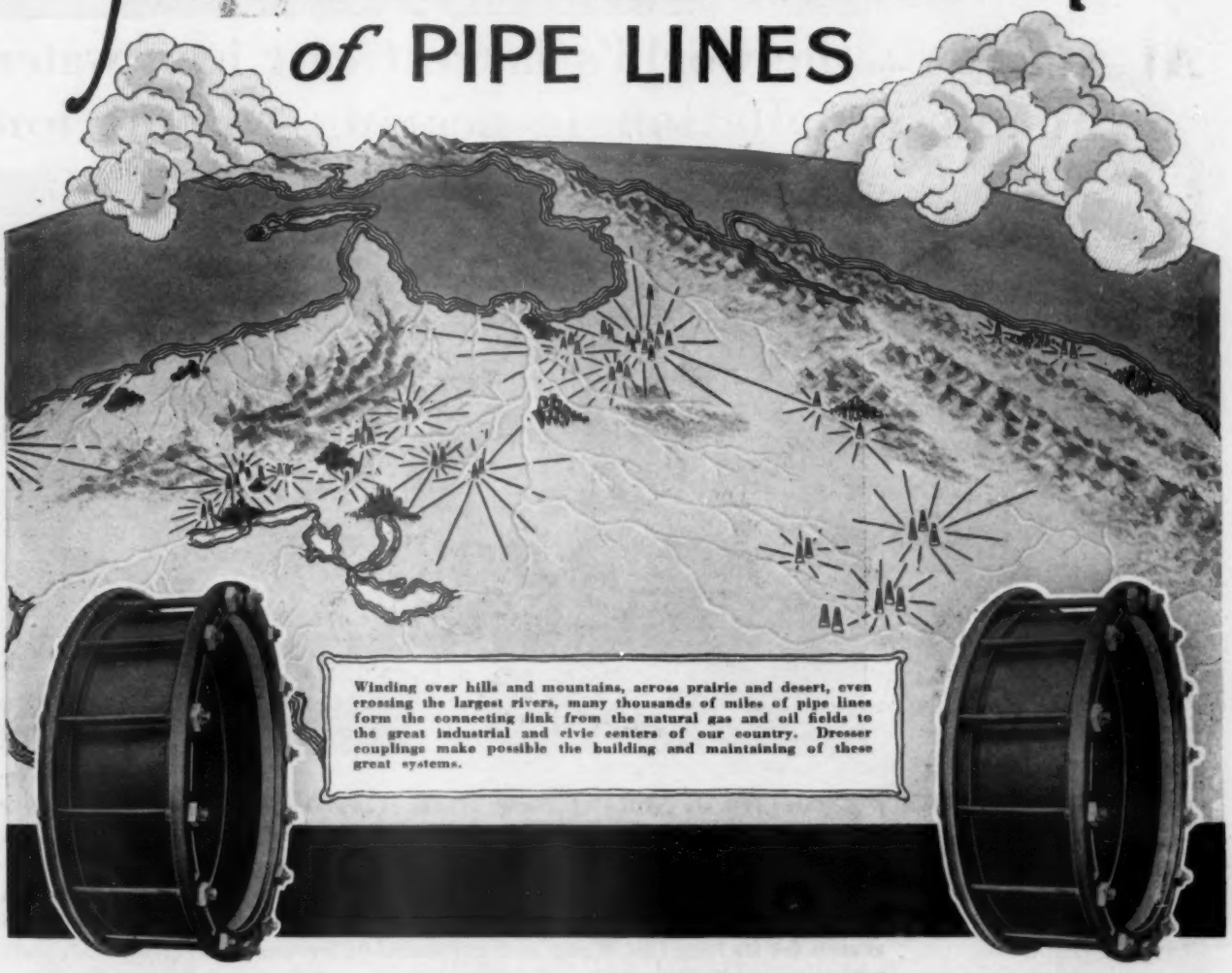

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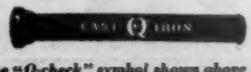
If you, Mr. Engineer, or you, Mr. City Official, are in any doubt regarding the kind of pipe to put down for any water, gas or sewer job, we shall appreciate an opportunity to place all the facts and figures before you. Address The Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, 309 People's Gas Building, Chicago. Cast iron pipe bearing the "Q-check" trade mark is obtainable from the following leading pipe founders: Alabama Pipe Company, Anniston, Ala; American Cast Iron Pipe Company, Birmingham, Ala.; James B. Clow & Sons, 219 N. Talman Avenue, Chicago, Ill.; Donaldson Iron Company, Emaus, Pa.; Glamorgan Pipe and Foundry Company, Lynchburg, Va.; Lynchburg Foundry Company, Lynchburg, Va.; National Cast Iron Pipe Company, Birmingham, Ala.; United States Pipe and Foundry Company, Burlington, N. J.; Warren Foundry and Pipe Company, 11 Broadway, New York.

A typical section of Albany's great cast iron supply line.



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HENRY M. RILEY, Editor

Forestalling Competition

THE WIDESPREAD ACCEPTANCE of electricity as a cooking medium has long been an important aim of the electric industry and neither money nor brains have been spared in order to attain this goal. Indeed, in view of the great preponderance in the cost of cooking with electricity as compared with gas, one is forced to admire the grim determination of the electric man to accomplish his purpose.

Merely a cursory examination of some facts should hearten those gas men who might be inclined to bolt at the first smell of powder, and convince them that their front line trenches can be readily held if they will but use the proper ammunition.

As indicated, the gas range enjoys a very decided advantage from the standpoint of operating cost. But, at this stage we must keep well in mind that the electric range salesman will not tell the prospect that it costs two or three times as much to use his appliance as it does a gas range. Rather, he will state that it will only cost four or five dollars more a month —if indeed, he says anything at all in this connection. One argument in rebuttal is that these four or five dollars will take care of the better portion of the expense of operating a gas water heater.

Still another point. Psychologically, the gas argument holds the edge. The user of the gas range is actually cooking with fire, so to speak. And from time immemorial man has cooked with fire in some form or other.

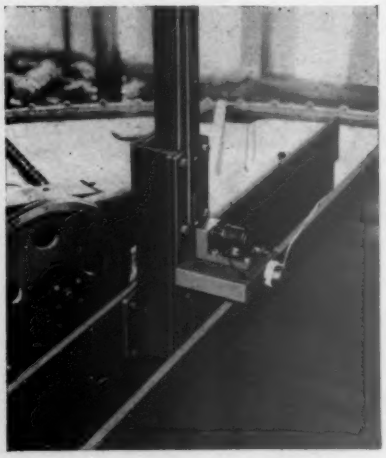
In the matter of design the gas range is correct. At least it is as perfect as the electric range, for the simple reason that the latter has copied to the letter the gas range in its makeup and appearance. In this connection we have actually heard the remark passed that "they use electricity in that gas range."

And, as to the variation in consumption, the gas range possesses limitless gradations, whereas the electric range is limited to only a few.

Further, the electric range generally has a first cost quite in excess of the gas unit.

If the electric range has any advantage and if this advantage is to be capitalized in its favor, it will center in some more modern method of selling. And this selling phase will attempt to put across the groundless claim that it is more "up-to-the-minute" to use electricity for cooking.

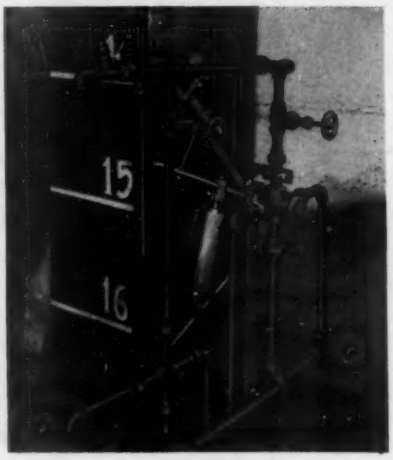
Outdoing the electric man's scheme of selling will forestall competition. If we plan accordingly we may be sure that we will avoid the troubles and heartaches such as were induced by a too-early loss of the lighting load.



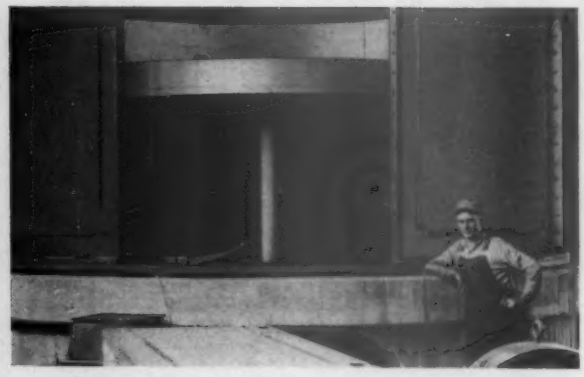
Left—Contactor on Prover Scale. This synchronizes readings of the meter with those of prover scale

Right—Automatic 4-Way Valves. These synchronize the opening and closing of the rotary air valve and the hydraulic valve

Left Center—View into Holder. One cylinder section is removed showing cast iron piston and plunger, also safety springs at base



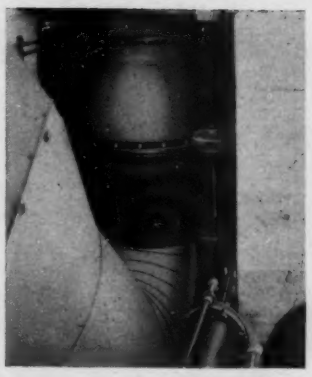
Details of New Dry-Type Prover



Right Center—View of Prover and Accessories

Lower Left—Foundation of Prover. Some control equipment is located in the pit

Lower Right—Rotary Air Valve



Proving Large Meters

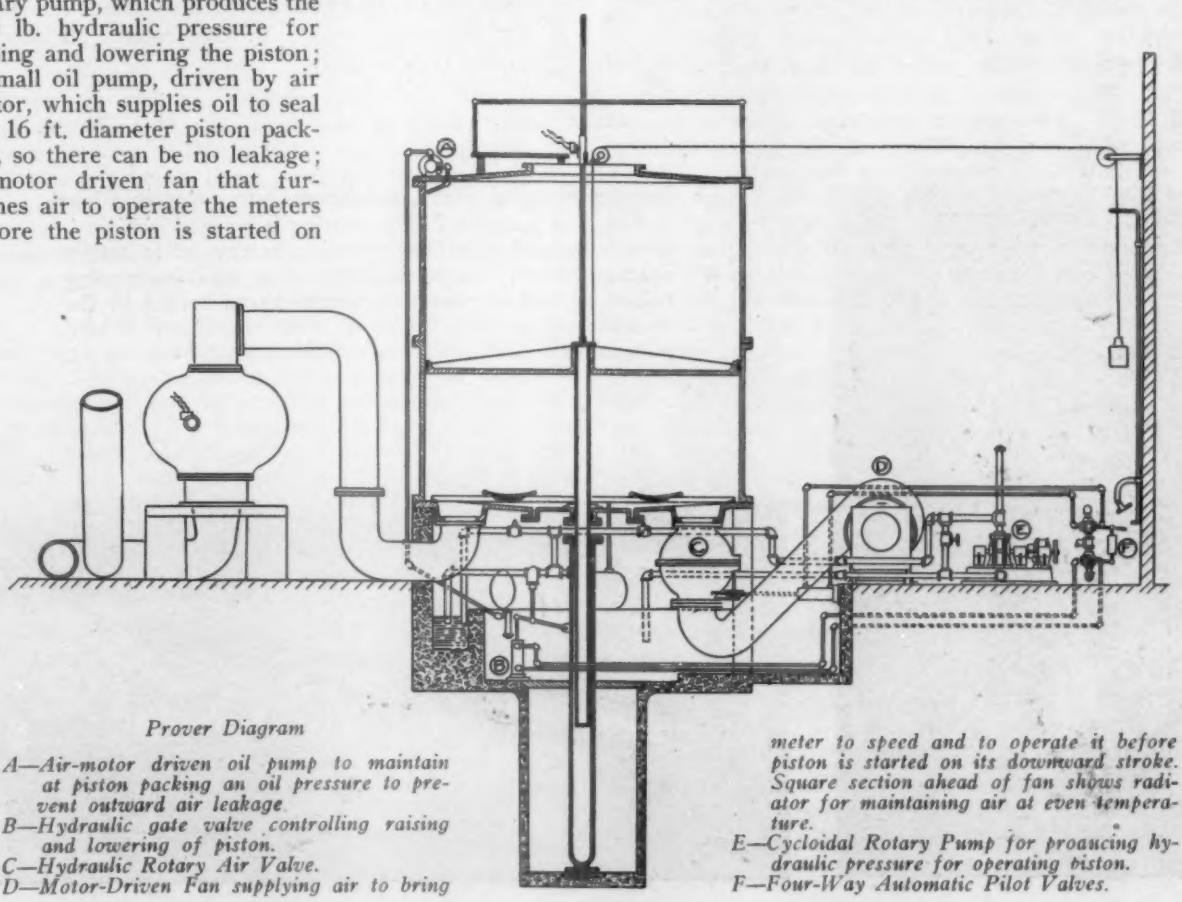
New dry-type prover developed by Connersville engineers

THE growth of the gas industry has made necessary the use of meters of much larger capacities than were formerly used in station and distribution service. But these larger meters could only be tested at the lower rates of flow, since proving equipment had not been built with proportionate increase in capacities. To meet these needs a dry-type gas-meter prover having a displacement of 2800 cubic feet per stroke, has been erected and equipped in the laboratories of the Connersville Blower Company to be used for testing large gas meters of various types and designs. In designing and equipping this 2800 cu. ft. prover, the company has been assisted by suggestions from engineers of the Bureau of Standards and also of the gas industry.

This prover consists of a cast iron cylinder having an inside diameter of 16 feet and a height of 16 feet above the top of the foundation, with a closely fitted cast iron piston that is raised and lowered within the cylinder by a hydraulic plunger. Electrical means record the stroke. Auxiliary equipment includes a motor driven cycloidal rotary pump, which produces the 200 lb. hydraulic pressure for raising and lowering the piston; a small oil pump, driven by air motor, which supplies oil to seal the 16 ft. diameter piston packing, so there can be no leakage; a motor driven fan that furnishes air to operate the meters before the piston is started on its downward stroke; a radiator, located at the inlet to the fan, through which water is circulated to maintain an even air temperature; and a switchboard for operating the various motor driven auxiliaries.

The prover is controlled by a hydraulically operated rotary air valve with hand scraped seat and a hydraulically controlled gate valve for raising and lowering the piston. The opening and closing of the air valve and water valves which regulate the rate of piston fall are synchronized by 4-way automatically operated pilot valves. Electrical contactors synchronize the readings at the meter with those of the prover. Indicating thermometers and pressure gauges are used to show the condition of the air in the prover and at the meter.

The operation of the prover is as follows: The piston is first raised to its top position by the cycloidal hydraulic pump. The fan is then started and the opening of the rotary air valve is set to give the desired rate for the test. The air then leaves the fan and enters the prover at the bottom, leaves the prover and enters the meter, and thence goes back to the fan. The hydraulic valve is adjusted to permit the lowering of the plunger at the



Prover Diagram

A—Air-motor driven oil pump to maintain at piston packing an oil pressure to prevent outward air leakage.
B—Hydraulic gate valve controlling raising and lowering of piston.
C—Hydraulic Rotary Air Valve.
D—Motor-Driven Fan supplying air to bring meter to speed and to operate it before piston is started on its downward stroke. Square section ahead of fan shows radiator for maintaining air at even temperature.
E—Cycloidal Rotary Pump for producing hydraulic pressure for operating piston.
F—Four-Way Automatic Pilot Valves.

Control Equipment. At left, electric contactor for meter indications. Center, cycloidal rotary pump providing hydraulic lift of prover piston. Right radiator system for air temperature control

same rate. The flow of water through the radiator at the inlet of the fan is so regulated that the temperature of the air entering the prover is the same as the temperature of the prover casing. The operator then lifts the starting lever which causes the rotary air valve to close and the hydraulic valve to open. The lowering of the piston begins as the air passes from the prover to the meter and out the make-up opening. At each revolution of the meter dial electric contact is made, locating a rider on the prover scale. Sometimes contact is made for each 10 revolutions, or 100 revolutions, depending upon the size of the meter.

As the piston approaches the bottom the safety trip causes the closing of the hydraulic valve and opening of the rotary air valve. The pressure from the fan then operates the meter as at the start. The cycloidal hydraulic pump is then used again to raise the piston to its upper position. While the piston is being raised, the operator on top of the prover reads from the scale the positions of the riders, which have been located electrically. The air to supply the piston displacement on the up stroke enters the make-up opening. The rate of flow is determined by a stop watch. Another observer makes record of the prover air pressures and temperatures and the meter operation data. Since the air metered does not come in contact with water, the comparison of the meter volume to that of the prover volume is reduced to 30″Hg. barometer and 60° F. temperature; no humidity correction is necessary.

Laying Natural Gas Line Across San Joaquin River

The San Joaquin River crossing is part of a 16-inch branch line, 92 miles long, running northward to supply natural gas to Stockton, Sacramento and intervening points, as well as many communities now served by the distribution systems radiating from the manufactured gas plants in both Stockton and Sacramento, California.

Determination of the Coefficient of Friction in Long Distance Natural Gas Distribution Systems

EUGEN GUMAN

Zeitschrift des Vereins Deutscher Ingenieure, 1930, pages 107-110

LONG distance gas distribution is becoming of constantly increasing importance in modern distribution of energy. Extensive natural gas long distance distribution systems have been built in the United States within the past fifty years. There systems have been calculated only on the basis of purely empirical formulae. Although the problem has been followed out very thoroughly from the scientific and practical standpoints in the case of smooth pipes by the classic laboratory experiments of various German and English investigators, nevertheless the results, which were obtained in these experiments, cannot be applied without some change to commercial pipes with rough inner surfaces. Disturbing structural factors are also present in long distribution systems, such as the unavoidable pipe connections, bends in horizontal and vertical planes, devices for stopping the flow of gas, water pots, branch connections and the like, which have an influence on the flow of gas in the mains which can scarcely be accurately determined by calculation.

Coefficient of Practical Value

Hence, a coefficient of friction, in which these disturbing elements are taken into consideration, would be a very useful factor for practical purposes, and in order to determine it, it is necessary to have available the results of many experiments carried out on existing long distance transmission lines. A coefficient of friction can be calculated numerically from these results.

The American Bureau of Mines has instituted a number of such experiments in conjunction with the American Gas Association (see T. W. Johnson and W. B. Berwald, Flow of Natural Gas Through High Pressure Transmission Lines, United States Bureau of Mines, Serial 2942). Unfortunately, these investigators limited themselves only to testing the Weymouth formula which is much used in America in calculating the flow of gas in high pressure mains. Viscosity determinations on the flowing gas were not made in these experiments, so that the results cannot be connected with the more recent observations of the Reynolds science of similarity. The specific gravity of the flowing gas changes in these experiments from 0.562 to 1.058 (based on air), wherefrom a greater change in viscosity is to be deduced. The variations obtained with the Weymouth formula, from minus twenty per cent to plus forty-eight per cent, can be very considerably reduced by recalculation in accordance with the theory of similarity, and the quite marked scattering of the points thus obtained can be assigned only to a marked change in the Reynold's figures.

Similar investigations were considered on existing long distance natural gas distribution systems, however, the required measuring instruments were not available. It was only in the year 1929 that it became possible to carry out investigations on the Sarmas-Turdaer long distance distribution system in Roumania with the aid of very accurate registering instruments. These tests were started on March 1, 1929 and were continued in uninterrupted manner until August 31, 1929.

This long distance transmission system feeds a large industrial area with natural gas. Hence, it would not have been possible to stop the flow of gas through the mains during the experiments without inflicting grave injury on the manufacturing establishments using the gas. Hence, the investigations had to be carried out while the gas was being used. Any prolonged permanent delivery of gas through these mains was impossible for the reason that they were very long and had many service connections leading to plants and domestic consumers. It was, therefore, necessary to calculate the coefficient of friction from the charts that were obtained from the measuring instruments. This method gave results which varied quite considerably, but on the other hand it is a method which takes into consideration the actual practical conditions under which the distribution system operates. In calculations carried out on long distance mains only average figures pertain.

Theoretical Fundamentals

The following symbols are used in the formulae that are derived below and their significance is explained here. The symbol (p) denotes the absolute pressure of the gas in kilograms per square meter (to convert this into pounds per square foot multiply by 0.204). The symbol (G_g) is the specific gravity of the gas in kilograms per cubic meter (to convert this into pounds per

cubic foot multiply by 0.62). The symbol (s), equal to G_g/G_a equal to R_a/R_g, is the specific gravity of the gas, based on air. The symbol (T) is the absolute temperature. (All temperatures are given in degrees C in the calculations and must be converted to degrees F by multiplication by 1.8 and addition of 32.0. To obtain the absolute temperature in degrees F, it is necessary to add 459.4 degrees F). The symbol (R_g) is the gas constant for the gas, while the symbol (R_a) is the gas constant for air. The symbol (R), equal to wD/v, is the Reynolds coefficient. The symbol (w) is the average speed of flow of the gas through a given cross-sectional area in meters per second (to convert into feet per second multiply by 3.3). The symbol (g) is the acceleration due to gravity (32 feet per second per second). The symbol (l) is the length of a stretch of main in meters (to convert into feet multiply by 3.3). The symbol (L) is an equivalent length of the long distance distribution main in meters. The symbol (f) is the coefficient of friction, while the symbol (D) is the width of the main in meters and (Q) is the quantity of gas that flows through under normal conditions in cubic meters per second (to convert into cubic feet multiply by 35.3). The symbol (n) is the absolute viscosity in grams per centimeter (to convert into grains per inch multiply by 42.1). The symbol (v) is the kinematic viscosity in square meters per second (to convert into square feet per second multiply by 10.76).

The equation which was derived by Jakob (see Zeit. d. Ver. Deut. Ingen., 1922 volume 66, page 179, equation number 13) is given below with the preceding symbols introduced therein.

$$f = g(3.1416/4)^2(T_o/P_o)^2(R_a/s)\ (D^5/Q^2)\ \frac{(p_1^2-p_2^2)}{Tl} - 0.5(D/l)\log(p_1/p_2) \ldots (1).$$

In this equation the symbols (p_o) and (T_o) indicate the temperature and pressure pertaining to the normal state in which the quantity (Q) is calculated.

Factor To Be Omitted

The logarithmic member of this equation gave a value of two units at the most for (f) in the sixth decimal place in the following experiments, so that it can be omitted from the calculations without introducing any appreciable error. (This logarithmic quantity may be omitted in all calculations on long distance lines without any great error. A limit has been set for which this can be done by H. M. Spiers in his paper delivered before the World Power Conference in 1928, namely l/D greater than 200. It is thus possible to simplify equation number (1) and solving it for (Q) to obtain the follow equation:

$$Q = \frac{3.1416}{4}\left(\frac{T_o}{P_o}\right)\left(\frac{Rl\,(p_1^2 - p_2^2)\,Ds}{f\quad stl}\right) \ldots (2)$$

This equation has a similar form to that of the Weymouth equation. The value for (f) is then obtained from the following equation: $f = 0.04363D^{-1/3}$. This means that the coefficient of friction is dependent on the speed and the viscosity, which contradicts the science of similarity.

It is advisable to express the Reynolds coefficient as well with the aid of directly mensurable quantities. Hence, when the flow of gas per second, that is (Q) cubic meters per second, is introduced into this equation, then the following expression is obtained:

$$R = \left(\frac{40}{3.1416}\right)\left(\frac{P_o}{T_o}\right)\left(\frac{s}{R_1}\right)\left(\frac{Q}{D_n}\right) = cQ \ldots (3)$$

Hence, the factor (R) and also (f) are dependant only on (Q).

If the quantity of gas flowing through the mains is diminished by the loss in distribution, then the Reynolds coefficient also changes and the coefficient of friction as well. Hence, these magnitudes must be referred to a definite place in the long distance main, which is at best the beginning of the main.

Deducing Equation Number Four

If the loss of gas, which is uniformly distributed throughout the entire main when the high pressure system is properly maintained, is designated as (M) for a length of one meter and one second time, the quantity of gas that flows into a stretch of the main of length (l) with the symbol (Q) and the quantity of gas which flows out of this stretch with the symbol (Q^1); furthermore, if equation number (2) is solved for ($p_1^2 - p_2^2$), and finally if it is written in the differential form for a differential length dl_x, which is removed from the beginning of the stretch of main by the distance (l_x), then the following equation is obtained:

$$-2pdp = \left(Kl_x\right)\left(\frac{(Q - Ml_x)^2}{D^5}\right)\left(dl_x\right)$$

In this equation (f_x) denotes the coefficient of friction for (dl_x) and (K) is a constant which is dependant on the flowing gas on the conditions under which it exists, the temperature and on the measuring system employed.

The simple power formula, namely

$$f = c_1\left(\frac{1}{R}\right)^{c_2}$$

may be used for the function f = function (R) in the calculations which follow and in which the influence of the loss of gas and of the smaller quantities of gas taken out of the main in the normal distribution of the load has on the delivery of the main. The aforementioned power formula is used with the condition that the exponent (c_2) remains unchanged only within definite limits of (R). If equation number 3 is introduced into the above equation, the following is obtained:

$$f_x = c_1\left(\frac{1}{cQ_x}\right)^{c_2}$$

When this equation is integrated between p_1 and p_2 as well as between 0 and 1, then the following equation is obtained:

$$p_1^2 - p_2^2 = \left(Kf_1\right)\frac{Q^2}{D^5}l^1 \ldots (4)$$

in which (f_1) is the coefficient of fraction at the beginning of the main.

If the long distance main is subdivided into sections of main by branch connections and if these section lengths are designated as $l_1, l_2, l_3 \ldots l_n$, and if the quantities of gas taken from these stretches of main are designated as $q_1, q_2, q_3 \ldots q_{n-1}$, and the quantities of gas flowing into the individual sections of the main are de-

signated as q_1, q_2, q_3 . . . q_n^{-1}, and the quantities of gas flowing out of the sections as Q'_1, Q'_2, Q'_3 . . . Q'_n, the coefficients of friction at the beginnings of the sections by f_1, f_2, f_3 . . . f_n, finally the pressure at the beginning of the long distance main as (p_1), at the middle of the main as (p_2) and at the end of the long distance main as (p_n), then the following equation holds good for the individual stretches of main:

$$p^2i - 1 - pi^2 = Kfi\frac{Qi^2}{D^5}li$$

By making the necessary changes in this equation with the aid of those that have been given above, the final form is reached as follows:

$$f_1 = \frac{p^2 - p_n^2}{LKQ_1^2/D^5}$$

It is seen that this equation contains quantities which are obtained by direct observation and with whose aid the coefficient of friction, (f_1), can be obtained.

The long distance main was laid in the years 1913/14 and has been in constant use since 1914. It consists of seamless steel pipe of 253 millimeters (10 inches) internal diameter and 267 millimeters (10½ inches) external diameter. The lengths of pipe are mostly twelve to fourteen meters (3.96 to 4.62 feet) long and are connected by coupling of the type shown in figure 1.

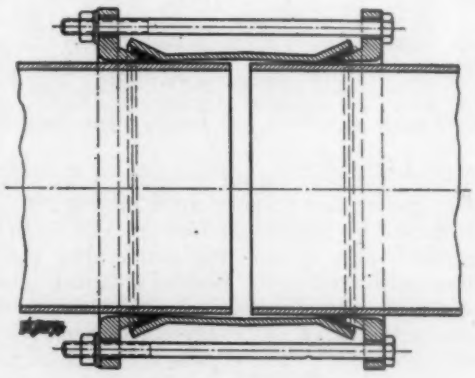


Fig. 1—Type of Coupling

The entire length of the main is approximately 50.5 kilometers (31.3 miles) and is divided into two sections of unequal length, one designated as (a) being 40.5 kilometers (25.1 miles) and the other designated as (b) of 8.2 kilometers (5.1 miles). The experiments were carried out on both of these sections, for larger quantities of gas were sent into the main by a gas works located at the 40.5 kilometer point, which might exert a certain disturbing influence on the calculations.

The gas wells, which fed the long distance distribution system, have a depth of 300 to 440 meters (990 to 1452 feet) and a gas pressure in the sand of 19 to 46.8 atmospheres, which is throttled down to ten to fourteen atmospheres by means of suitable throttle valves at the wells. The quantity of gas which is furnished within a unit period of one second varies between 2.9 to 4.5 cubic meters (102.4 to 158.9 cubic feet) at 760 millimeters pressure and 15 degrees C. (60 degrees F.). The final pressure of the gas at the end of the long distance line is 3.8 to 7.0 atmospheres.

The temperature of the gas, flowing out of the wells, varies very widely due to the different degree of throttling to which it was subjected. In order to obtain a technically-isothermic flow of gas, the gas was allowed to flow through a stretch of main approximately 1.8 kilometers (1.12 miles) in length. In this section of main the gas was allowed to attain the temperature of the surrounding medium. This initial stretch of main was further increased by means of collecting mains and pipelines so that the temperature of the gas at the beginning of the long distance distribution system at the town of Sarmas could be called quite uniform. The daily variation in temperature was scarcely noticeable. It amounted to at most 0.3 degree C. (0.54 degree F.), and the heating of the gas due to the temperature rising during the day added only tenths of a degree to the temperature of the gas. The temperature of the gas varied between minus 5.2 degrees C. and plus 13.5 degrees C. (22.64 to 56.3 degrees F.).

The exact length of the long distance main (a) amounted to 40,510 meters or 133,683 feet and that of the main (b) 8190 meters or 27,027 feet. The main (a) passes through quite hilly country. It has twenty-eight water separators, twenty-three points at which shut-off devices are arranged, and six branch lines. The bends in this part are not sharp and are made for the most part with the aid of special stuffing box couplings and short lengths of piping. The long distance main (b) is laid over flat country and is provided with only two water separators, four points at which shut-off devices are located, and two branch lines. There are few, and these only very wide, bends with the exception of one which is a sharp ninety degree bend.

Condition Inside of Pipe

The internal diameter of the main was assumed to be correct at 253 millimeters or 10 inches. The internal surface of the pipe line was observed at various points after the tests had been completed. It was found to be covered with a very thin, greenish-brown film, which was stuck fast to the steel pipe. This film or layer was found to consist of fine clay and marl dust, which came from the gas and oil sand of the wells. It was carried along in mechanical suspension by the gas and deposited on the interior of the pipes during a period of years. The coating was very thin and was never found in lumps or large accumulations. The conclusion that must be drawn is therefore that the effective diameter of the pipe line was reduced in only very inappreciable degree. The most that the deposit of dust does is to increase the roughness of the interior of the pipe.

The chemical composition of the natural gas coming from these gas wells has been watched ever since the well started producing and the data shows that the chemical competition is uniform in every respect. The analytical figures show that the proportion of carbon dioxide in the gas varied from a trace of 0.2 per cent, being altogether absent in certain cases. The proportion of oxygen varied from 0.12 to 0.2 per cent, while the proportion of nitrogen varied from 0.68 to 0.8 per cent. The percentage of methane varied from 98.94 to 99.25 per cent, indicating an average content of 99.2 per cent. The gas was also found to be entirely free from foreign substances. It is dry and contains very little sand or mud or other solid substances, so that the physical constants and coefficients of pure methane can be applied to the gas without any important error.

The specific gravity of the natural gas was calculated

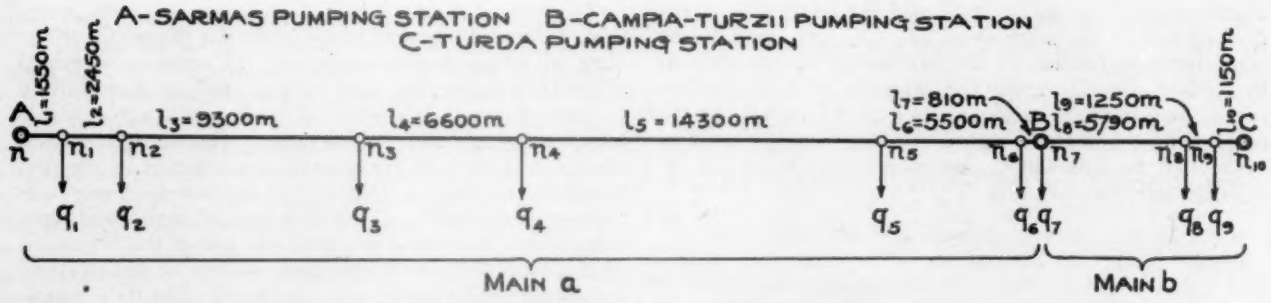
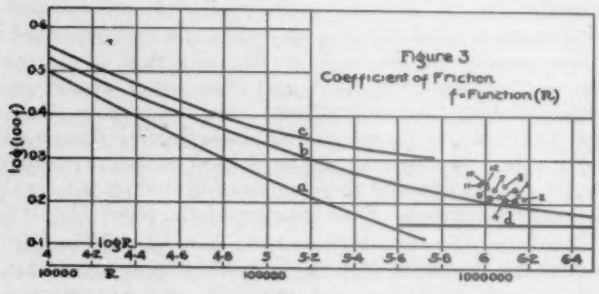


Fig. 2—Long distance pipe line in diagrammatic form

from its average chemical composition and was found to be 0.554 based on the dry weight of air as unity. Experiments were not carried out to determine the viscosity of the gas but that of pure methane was used instead without any error being incurred. This was found to be in centimeter-gram-second units on the absolute basis as 0.1025×10^{-7}.

The numerical values of the exponents of the coefficient of friction expressed in form of a power equation must be determined for calculating the equivalent lengths. It has been found that in a smooth pipe these values vary from 0.224 to 0.254 up to a value of 500,000 for (R) the Reynolds coefficient. These values were found by Jakob and Erk, but newer researches have indicated this formula loses its usefulness for rough pipes and for higher values of the Reynolds coefficient. The experiments have shown that the value of (f) the coefficient approach asymptotically a horizontal straight line, which is drawn through the ideal point (f) equal to infinity and (R) also infinity. The curves which were obtained by H. M. Spiers (see former reference mentioned in this article) include one for a value of (R) up to 1,400,000, which curve has an average slope between the values of (R) equal to 900,000 and (R) equal to 1,400,000 equal to an exponent of approximately 0.1. Inasmuch as this figure has only an unimportant influence on (L) and (f), the value of (c_2) can accordingly be set equal to 0.1.



When the following values are introduced into equation number 3, namely, (p_o) equal to 10,333 kilograms per square meter; (T_o) equal to 228.09 degrees C; (s) equal to 0.554; (g) equal to 9.808 meters per second per second, (R_1) 29.267; (D) 0.253 meter, then the following equations are obtained: $R = 34.168\, Q/n$ and $f_1 = (p^2 - p_n^2)\ /3882.98\ T\ Q^2 L$. These equations are used to make the numerical calculations from the data obtained in the experiments.

Figure 2 shows the long distance pipe line in diagrammatic form. The flow of gas through the various sections of the main, namely (Q_1), (Q_2) . . . (Q_{10}) were determined for a period of six months and recorded in tabular form, as well as the quantities of gas, corresponding to the observed quantities calculated back to the standard basis, and these figures were then used in calculating the equivalent lengths. The numerical results obtained in the tests made on the pipe line from which the final results can be calculated are given in tabulation number 1.

TABULATION NUMBER 1

Composite Results of the Test

Test No.	p in lbs. per sq. ft.	p_n in lbs. per sq. ft.	T in degrees C	Q in cubic feet per second	L in feet	n x 10^{-7} in grams per cm.	R x 10^{-6}	f
1	28411	17955	267.91	144.7	129360	1007	1.405	0.01654
2	29500	17950	271.66	158.9	129030	1019	1.507	0.01636
3	25670	14790	278.26	134.1	129690	1045	1.233	0.01744
4	25092	14870	283.18	130.1	132990	1059	1.198	0.01611
5	23670	12605	284.12	127.1	132900	1062	1.165	0.01661
6	24398	12650	286.52	137.6	132000	1071	1.206	0.01643
7	17955	16190	267.91	116.5	26000	1007	1.130	0.01698
8	17950	15690	271.66	127.1	26070	1019	1.223	0.01666
9	14790	12650	278.26	109.4	26100	1045	1.009	0.0173
10	14870	12710	283.18	109.2	26200	1059	0.985	0.0176
11	12605	10160	284.12	105.9	26200	1062	0.954	0.01744
12	12650	9870	286.52	110.1	26170	1071	1.002	0.01729

The results are also shown in figure 3, in which the log (100f) appears as a function of the log (R). The results obtained by Jakob and Erk are also included in this diagram. This is done for comparative purposes. This curve is marked (a). Results obtained on a rubber hose are shown in curve (b) and those for drawn steel tubes in the curve (c). The coefficient of friction calculated according to the Weymouth formula for the value of (D) equal to 0.253 meter is shown in a straight line which runs parallel to the X axis.

The experimental data obtained gave two groups of points: on the ordinate (R) equal to 980,000 average value of (f) 0.0175, and on the ordinate (R) equal to 1,215,000 average value of (f) 0.0166. If the average is taken of the first two experimental figures, then the value of (f) for a value of (R) equal to 1,460,000 is approximately 0.0164. It may be concluded from these numerical figures that the course of the (f) = (R) curve is parallel to the curve determined by Schwindin, and that in the region of values of the Reynolds coefficient 1,000,000 to 1,500,000 this function approaches so closely to the asymptote that the numerical values of the coefficient of friction can be assumed to be equal. The asymptote will lie at the point (f) equal to 0.015, and hence coincides with the curve (d) in figure 3.

The investigations have been concerned only with a quite limited range of the Reynolds coefficient and showed no difference as far as the diameter of the pipe and the viscosity of the medium flowing through it are concerned. Hence conclusions of great importance and wide applicability can scarcely be drawn from the re-

(*Continued on page 58*)

Comments Regarding Paper on "Theoretically Correct Gas Plant"

A. M. BEEBEE

General Superintendent, Gas Dept., Rochester Gas & Electric Corporation

Note: The first portion of this article appeared in May, 1930 issue of American Gas Journal.

Explanation of Vittinghoff's Appendix I

THE tables of Vittinghoff, below, were intended to show the inaccuracy of Steere's data in the following manner. Starting with and accepting as correct Plate III, it was agreed that the 3 million foot plant per day had a conversion cost of 20½c per M. From this it was argued and the figures were offered to show that the same carbonizing plant with producers added would show a conversion cost of 19.2 cents per M. whereas Mr. Steere's chart (Plate X) showed a conversion cost of 29c.

In addition to this point, Vittinghoff's figures were an attempt to show that a producer gas fired plant was less when plants of equal size were used. It is true it is not fair to compare a 3 million foot gas fired plant with a 4,680,000 producer fired plant, but if you will refer a little more in detail to the conclusions you will find that no such comparison was intended. The conversion cost on the 4,680,000 producer fired plant was shown to be 19.2c and if you will refer to Plate III you will find that Steere's chart shows the conversion cost of a gas fired plant of this same capacity to be 20c. In other words, it was an attempt, using Steere's own charts for his oven gas fired plant, to show that it gave a higher figure than a producer gas fired plant, assuming the same sendout for both.

It is appreciated that due to the way this matter was presented by Vittinghoff that a misunderstanding can readily arise and, for the sole purpose of taking care of this situation, Appendix III was prepared, showing the set-ups by Mr. Battin of the U. G. I. Company. If you will refer to Appendix III and the tables at the end, you will see the minute the surplus coke produced by an oven gas fired plant must take a decreased revenue in excess of 50c a ton that producer gas firing is more economical.

Of course you must realize that this paper was intended to discuss this problem primarily from the viewpoint of the average gas utility. There is no question but what in industrial markets where the additional coke can be disposed of without a loss in value, that oven gas firing will be cheaper. However, this is not typical of the average gas utility.

In other words, analyzing the proposition on the basis of the gas consumption per meter and the coke consumption per meter, a producer gas fired plant balances these two loads very nicely. If coke is produced in excess of this balance (when considering the average gas utility) it must go into foreign markets and as a rule suffer competition with other companies which is usually apt to reduce its value in addition to absorbing the freight which will further reduce its value. In other words, Battin's analysis indicated that if this reduction in the value of the coke exceeded 50c a producer gas fired plant was more economical and for the average gas utility to attempt to seek foreign markets and pay freight on it is apt to suffer a reduction in the value of the coke greatly in excess of 50c.—*A. M. Beebee.*

APPENDIX I

Showing a comparison between costs of gas from an Oven Gas Fired type of plant as compared with a Producer Gas Fired type of plant, using Mr. Steere's calculations for the former and adding costs for producer gas firing and dividing by the resulting larger quantity of gas available for sale.—Drawn up by Mr. H. Vittinghoff, Stone & Webster, Boston, Mass.

The purpose of these tables is purely to show the relation between Producer Gas and Oven Gas firing.

CASE I

Assume 3,000 M cft. per day Plant—Gas Fired—100 L. F.
Yield 7,700 cft. per ton
Coal carbonized—390 tons per day @ $5.00 = $1,950 (A)
Ammonium Sulphate 24 lbs. per ton @ 390 × ⅜ cent ..... = $ 35.10
Tar 10 gals. per ton @ 390 × 5½ cents..... = 214.20
$249.30 (B)

Coke Yield—75% of 390 tons = 292.5 tons of coke

292.5 T × $7.00 Market Price × .931 Factor for size ..... = $1,910 (C)
Conversion Cost 20.5 cents (Plate 3) × 3,000 = 615 (D)
Conversion Cost per ton $1.58
Conversion Cost per M 20.5 cents
Administrative Cost 13 cents (Plate 8) × 3,000 ..... = $ 390 (J)

Plant Cost 3,000 × $450 (Plate 5) = $1,350,000 (No Holders)
Land 5% 67,500

Plant Cost $1,417,500
Inventory 10% 141,750

Total $1,559,250

Interest 8%	124,800	
$124,800 ÷ 365	$ 342 (P)	
Depreciation 6 2/3% of $1,350,000	$ 90,000	
$90,000 ÷ 365	$ 246 (H)	
	$ per day	cents M
A	$ 1,950	65.0
E (D-B)	366	12.2
	$ 2,316	77.2
C	1,910	63.7
	406	13.5
H	246	8.2
J	390	13.0
P	342	11.4
Q	$ 1,384	46.1

CASE 2

Assume same Plant, but Producer Fired—100% L. F.
Coal Carbonized 390 Tons @ 12,000 cft. = 4,680,000 cft.

Coal Carbonized (same as Case 1)	$1,950 (A)	
Sulphate and Tar (same as Case 1)	249 (B)	
Coke Yield 75% of 390 Tons	292.5T	
Oven Fuel (13% of Coal-Nut, Pea, and breeze)	50.7	
Large Coke for Sale	241.8T	
Coke Credit Case 1	$1,910	
241.8 Tons @ $7.00	1,690 (C)	
Oven Fuel 50.7 Tons @ $4.33	$ 220	(Add to Conversion Cost)
Conversion Cost Case 1	$ 615	
Oven Fuel	220	
Producer Attendance 6 men @ $5.	30	
Producer Maintenance	10	
Additional Purification @ 1c	17	
Miscellaneous	10	
Conversion Cost	$ 902 (D)	
Conversion Cost Per Ton $2.31		
Conversion Cost Per M 19.2c	(See Plate 10)	
Administrative Expenses Case 1..	$390	
Additional Plant $236,250		
Additional Taxes @ $20 per 1,000 =	$4725	
$4725 ÷ 365	13	
Administrative Expenses	$ 403 (J)	
Plant Cost (Case 1)	$1,350,000	(no Holders)
Producer Plant	150,000	
Larger Gas Equipment	75,000	
	$1,575,000	
Land 5%	78,800	
Plant Cost	1,653,800	
Inventory (Same as Case 1) ..	141,750	
Total	$1,795,550	
Interest 8%	144,000	
$144,000 ÷ 365	394 (P)	
Depreciation 6-2/3% of 1,575,000	105,000	
$105,000 ÷ 365	288 (H)	

	$ per day	c /M
A	$1,950	41.7
E (D—B)	653	13.9
	2,603	55.6
C	1,690	36.1
	913	19.5
H	288	6.2
J	403	8.6
P	394	8.4
	$1,985	42.7

Note: The Plates referred to may be found in the 1928 Proceedings of American Gas Association; pages 991-1017.

APPENDIX II

TOTAL GAS COSTS (as per Mr. Steere's paper)

Coke Market Value per ton	$5.00	$6.00	$7.00	$8.00	$9.00	$10.00
Case I—Coal Gas Plant (oven gas fired)	.7162	.6262	.5352	.4442	.3542	.2632
Case II—Water Gas Plant	.5406					
Case III—Coal Gas (oven gas fired) Base Load with Water Gas for Balance	.6866	.6236	.5606	.4976	.4346	.3716
Case IV—Coal Gas (Producer Gas fired) Base Load with Water Gas for Balance	.7148	.6746	.6344	.5942	.5540	.5138

APPENDIX III

Discussion of F. W. Steere's Paper "Theoretically Correct Gas Plant" and of A. M. Beebee's Comments Regarding That Paper

H. W. BATTIN

The United Gas Improvement Company
Philadelphia, Pa.

Coke Credit

As Mr. Beebee points out, when a coke oven plant, underfired with gas from an auxiliary producer plant is installed, the local demand for coke should be just enough to take all the coke except that used in the producers. In that way the maximum price is obtained for the coke.

Now if a plant underfired with oven gas, with the same net gas producing capacity as the producer gas fired plant were installed, more coke would be produced. This extra coke amounting to possibly 47% of the total, would have to be sold outside of the city. The coke so sold would net $1.50 to $2.00 per ton less than the coke sold locally. This fact has been brought out.

Conversion Cost

In determining the conversion costs, they must be based on plants of the same coal carbonizing capacity. For instance, an oven gas fired plant producing 3,000 MCF net daily, will carbonize 390 tons of coal, whereas a producer gas fired plant producing 3,000 MCF net daily, will only carbonize 250 tons per day. Assuming that Mr. Steere's conversion cost curve is correct for oven gas fired plant, the conversion cost of producer gas fired plants should be determined by adding to the former cost, the cost of operating the producers. However, in using the curve, plants of the same coal carbonizing capacity rather than gas making capacity should be considered.

For example, assume two plants producing 3,000 MCF net daily, one an oven gas fired and one a producer gas fired plant. The conversion cost of each plant would be determined as follows:

The coal carbonized in the oven gas fired plant would be

$$\frac{3000}{7.7} = 390 \text{ tons},$$

whereas in the producer gas fired plant it would be

$$\frac{3000}{12} = 250 \text{ tons.}$$

Oven Gas Fired Plant

Mr. Steere's curve, plate 3, shows conversion cost on a 3000 M plant of 20.5c per MCF or 20.5c x 3000 M or $615 per day.

Producer Gas Fired Plant

This plant would carbonize only 250 tons daily. On the basis of an oven gas fired plant, this would represent a make of 250 x 7.7 M or 1925 MCF daily.

Mr. Steere's curve, plate 3, shows conversion cost on a 1925 M oven fired plant of 20.9c per MCF or 20.9c x 1925 M or $403 per day. To this figure should be added the producer plant operation, which operation will result in releasing oven gas and thereby bringing up the net gas production to 3000 MCF daily.

The set up then will be as follows:

Cost as shown above	$403	per day
Producer attendance—4 men at $5	20	" "
Producer Maintenance	10	" "
Additional Purification 3000 - 1925 = 1075 M at 1c	11	" "
Miscellaneous	10	" "
Total	$454 = 15.1c per M.	

No charge is made for the producer fuel because no credit is taken for it in coke credit.

In comparison with this figure, Mr. Steere's curve, plate 10, shows the conversion cost of a 3,000 MCF net per day producer gas fired plant to be 29.5c per MCF or 29.5c x 3000 M or $885 per day, which I believe is entirely too high as borne out in practice.

Total Production Costs

Taking into account the determining of coke credits and conversion costs as I have indicated above, I have worked out the production costs for 3000 MCF and 4680 MCF plants with both oven gas and producer gas firing. These figures, tabulated on the attached sheets, show that the production cost is lower on the producer fired than on the oven gas fired plants, where the surplus coke must be sold at 50c per ton or more below the local market price.

Turnover and Fuel Competition

Mr. Steere says "one of the great problems of the utility business—both power and gas—is the high ratio of investment to gross revenue. A gas company turning over its capital once in five years can never expect to become a material factor in furnishing fuel to industries which turn their capital over four or five times in one year."

I cannot see why the relation between a gas company's capital turnover and the capital turnover of a company to which the gas company wished to sell gas, should have any bearing upon the amount of gas that may be involved, and which may be in competition with coal, oil or electricity. However, the gas company's turnover as compared with the turnover of coal, oil or electric companies, may have some bearing upon the gas company's ability to meet the coal, oil or electric competition.

Below I have tabulated in round numbers the investment, gross revenue and ratio of investment to gross revenue for several coal, oil, electric and gas companies for the year 1927 as shown in one of the well known investment manuals.

INVESTMENT AND GROSS REVENUE

	Investment	Gross Revenue	Ratio Investment to Gross Revenue
Coal Companies			
A	$ 31,400,000	$ 9,600,000	3.3
B	65,300,000	41,000,000	1.6
C	18,000,000	5,300,000	3.4
D	137,000,000	43,300,000	3.2
E	10,400,000	4,700,000	2.2
	$ 262,700,000	$ 103,900,000	2.5
Oil Companies			
F	186,300,000	141,100,000	1.3
G	303,900,000	168,800,000	1.8
H	206,000,000	104,100,000	2.0
I	455,600,000	61,500,000	7.4
J	110,700,000	43,500,000	2.5
	$1,262,500,000	$ 519,000,000	2.4
Electric Companies			
K	224,000,000	39,800,000	5.6
L	189,000,000	47,400,000	4.0
M	141,600,000	37,000,000	3.7
N	210,000,000	71,600,000	2.9
O	261,000,000	71,000,000	3.7
	$1,025,600,000	$ 266,800,000	3.7
Gas Companies			
P	37,080,000	10,800,000	3.4
Q	93,500,000	25,800,000	3.6
R	50,000,000	16,400,000	3.0
S	104,000,000	35,000,000	3.0
T	19,000,000	5,700,000	3.3
	$ 303,580,000	$ 93,700,000	3.2

This shows that there is not a great deal of difference between the average ratios in the four classes of business and if the capital turnover were a determining factor, then manufactured gas should be able to compete successfully with coal, oil and electricity as a fuel.

The ratios given above are based on depreciated values. It is likely that coal and oil properties depreciate more rapidly than gas properties, so if the ratios were based on original costs, the gas companies would probably be shown in a much more favorable light than either the coal or oil companies.

Future Plants

Mr. Steere says "that the gas industry cannot safely proceed in the future on the theory that the base load should be coal gas."

The tendency to install coal gas for the base load is rapidly increasing, and insofar as we are able to forecast future conditions, I believe that, in general, we can consider that coal gas will continue to be the most satisfactory base load gas.

CASE I—3,000 M PLANT

	Oven Gas Fired Surplus Coke @ $5.50	Oven Gas Fired Surplus Coke @ $6.50	Oven Gas Fired Surplus Coke @ $7.00	Producer Fired
Coke for local market @ 7.00	155. T	155. T	155. T	155. T
Surplus coke to be shipped away	137.5	137.5	137.5	0
Total Coke for sale	292.5T	292.5T	292.5T	155. T
Average Price	$6.30x.931 Size Factor =$5.86	$6.76x.931 =$6.30	$7.00x.931 =$6.52	(Small Sizes Used in Producers) $7.00
Total coke credit per day	$1,715	$1,840	$1,900	$1,085
A—Materials	1,950	1,950	1,950	1,250
E—(D—B)	366	366	366	294
	2,316	2,316	2,316	1,544
C—Coke credit as above	1,715	1,840	1,900	1,085
	601	476	416	459
H—Depreciation 6 2/3%	246	246	246	235
J—Administrative	390	390	390	390
P—Return @ 8%	342	342	342	325
	1,579	1,454	1,394	1,409
Per MCF	52.6c	48.5c	46.5c	47.0c

CASE II—4,680 M PLANT

	Oven Gas Fired Surplus Coke @			Producer Fired
	$5.50	$6.50	$7.00	
Coke for local market @ $7.00	241.8T	241.8T	241.8T	241.8T
Surplus coke to be shipped away	213.2	213.2	213.2	0
Total Coke for sale	455. T	455. T	455. T	241.8T
Average Price	$6.30x.931 Size Factor	$6.76x.931	$7.00x.931	(Small Sizes Used in Producers)
	=$5.86	=$6.30	=$6.52	$7.00
Total coke credit per day	$2,665	$2,870	$2,965	$1,690
A—Materials	$3,035	$3,035	$3,035	$1,950
E—(D—B)	547	547	547	423
	3,582	3,582	3,582	2,373
C—Coke credit as above	2,665	2,870	2,965	1,690
	917	712	617	683
H—Depreciation 6 2/3%	333	333	333	321
J—Administrative	468	468	468	468
P—Return @ 8%	460	460	460	441
	$2,178	$1,973	$1,878	$1,913
Per MCF	46.5c	42.2c	40.1c	40.9c

Calculation of Gas Calorific Values by Nomogram

THE term "nomogram" can be described as the graphical representation of a formula by the use of which any number of calculations whose conditions satisfy that formula, can be worked out. If, therefore, in the case of gases, we allow the total heat units of the heat-giving constituents to be represented by the symbols *m*, *n*, *p* and *q*, we can get a simple formula from which the calorific value of any gas can be obtained, *i.e.*,

$$C.V. = m + n + p + q.$$

It is upon these lines that the accompanying graph is drawn up.

The nomogram consists of four scales graduated to represent the percentages of the heat-giving constituents. A fifth scale is graduated to read in B.Th.U. per cu. ft., and there are two blank reference lines which, for ease of description, are lettered *a* and *b*. It will be noticed also that the lines for the carbon monoxide and the unsaturated hydrocarbons are equal distances from the reference line *a*. This line and the hydrogen line are equi-distant from *b*, while finally this line and the scale for methane are equal distances from the scale for B.Th.U. per cu. ft. These scales are based upon the various gases having calorific values as printed on the graph, which figures are taken from Scott's "Standard Methods of Chemical Analysis." The unsaturated hydrocarbons, being somewhat uncertain in composition, are for the purpose of calculation, taken as propylene and given the calorific value of 2,347 B.Th.U. per cu. ft.

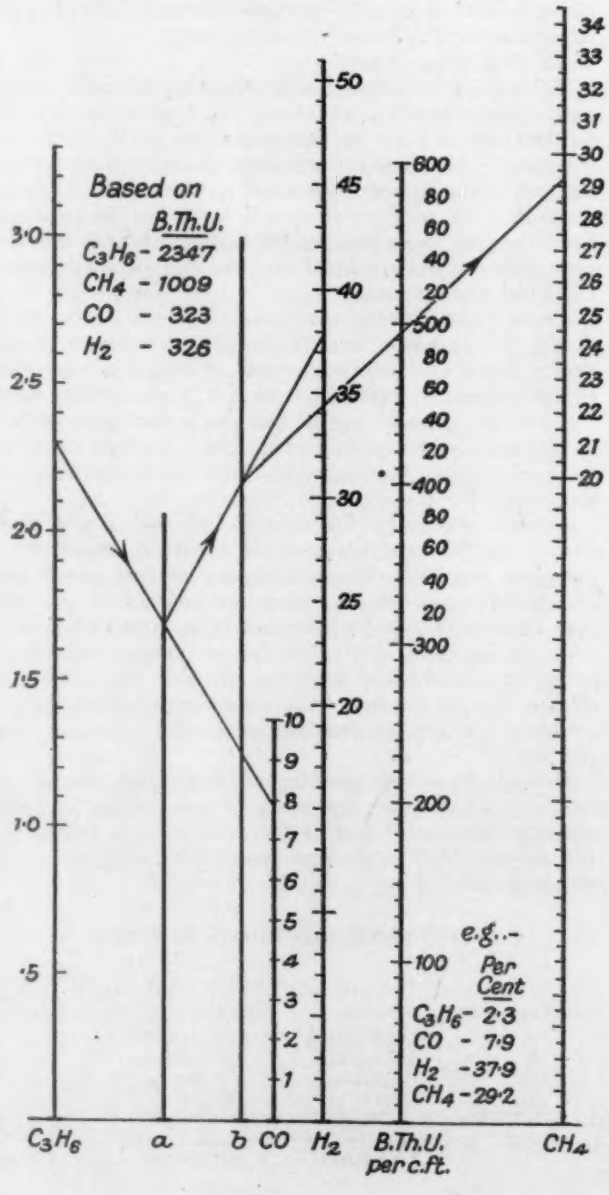
The first stage in the operation of the nomogram is the addition of the B.Th.U. of the propylene and the carbon monoxide. This is done by taking points at their respective percentages on the lines representing these gases and joining them by means of a straight edge, the sum of their B.Th.U. being indicated by the point at which this line cuts reference line *a*.

To this must now be added the heat units subscribed by the hydrogen. This is done by taking a point on the hydrogen line at its percentage and joining it by means of another movement of the straight edge to the sum of the first addition (the point on line *a*). The sum of the heat units, so far, is now represented by the point at which the second movement of the straight edge cuts line *b*.

In order now to obtain the calorific value of the original gas, there only remains to be added the heat units of the methane, and so a third movement of the straight edge is made, so as to join the last point on line *b* to the percentage methane.

The calculation is now complete and the calorific value of the original gas is read off in B.Th.U. per cu. ft. on the scale provided for that purpose. When operating with the straight edge it will be found advantageous to mark on the reference lines *a* and *b* with a pin instead of drawing lines every time. Finally, although this nomogram is drawn up primarily for coke oven gas, it could, with very little modification, be adapted for use with other gas.

—*F. Jones, The Gas World, Mar. 1, 1930*



Method of arranging Chili Trays in the Drying Room. Note the typical opening in the floor for ingress of the hot products of combustion.

Natural Gas Handles A "Hot" Assignment

DELPHIA PHILLIPS

WHEN the Farm Bureau of Orange County, California, is questioned about chili peppers, they immediately refer the questioner to the "Pepper King," J. A. Knapp of Garden Grove. Garden Grove is the center of the largest pepper growing area in the world, and Mr. Knapp is not only an enthusiastic grower of peppers, but is the man who originated the method of drying the chilis which has been in use in this locality for twenty-eight years, and is still the process employed in most places.

From time to time dehydrators have been experimented with but, so far, their use has not proved practical. Hitherto the investment in the average dehydrator has been too great to meet the financial demands of the pepper industry, but there is little doubt, in the opinion of Mr. Knapp, that eventually there will be some sort of dehydrator worked out that will do the drying. There are a few of them in operation in pepper growing districts, but their only advantage over the process of evaporation so long used, is in cutting labor costs. Dehydrators do not produce as satisfactory results in color, which is a very important factor in pepper drying.

The method developed by Mr. Knapp is very simple, and probably this very simplicity accounts for its use over so long a period of time.

The peppers are arranged on trays, 2 x 7 feet, having 1 inch mesh galvanized chicken wire bottoms. The rooms in the drying sheds may be of any dimension, with six feet sides giving the best results.

There are six feet excavations under the Knapp driers, and here are located the long pipe burners and the cold air vents which admit air from the sides of the cellar to the bottom. The best results are obtained at a temperature of 120 to 125 Fahr. The fuel used is natural gas, with a heating value of about 1150 B.T.U's.

The gas pipe burners are 1½ inches in diameter, with a hack saw slot cut every two inches on one side of the pipe, from which slot the gas flows for burning. These burners are placed 6 feet apart in the basement of the dryers.

The floor of the drying rooms have regularly spaced openings to permit the heat to enter, and vents on the roofs to allow the fumes and heat to pass off naturally, no forced draft being used. The trays are placed one on top of another in such a way that the heat and air can circulate between them.

The heat must be carefully regulated as peppers dried too hastily do not give the best results. The evaporating of moisture from green peppers (not green in color, but undried) is a slow process, due to the fact that the tough, leathery skin of the chili does not allow moisture to get through, and all of it must evaporate through the skin.

No automatic temperature control has as yet been devised that will take the place of the watchful care of the man in charge of the driers. If dried too quickly, the resulting product is dark and inferior in quality. The best chili powder is a fine bright red, which is proof that the peppers have been properly dried, and not slightly burned or dried until all their flavor or part of it has been lost. The pepper flavor is what is sought in this mild pepper as they are not high in capsicum. It requires seven days in the evaporators to properly cure the chilis.

About 2000 dry tons of peppers are produced per year by these driers. These would bring about $350 per ton in the market. Most of the chilis are sold to regions in the Mississippi Valley, where are located the establishments which manufacture all sorts of chili products.

Pimientos waiting for final sorting. Grader shown at the top and drying Kiln at the right.

The cost of gas for producing one ton of dried peppers is about $9.00, and it takes five tons of the green (undried) peppers to produce one ton of the dry. There are many plants in the pepper district and in some of these as high as 1000 tons per month have been cured. A higher temperature than 120 Fahr. in the driers would cost less money, but the result has proved to be less satisfactory. Approximately 13,000 cu. ft. of gas are used in drying 5 tons of green peppers.

Burner end of Pimiento Roaster or Kiln at the Stewart and Curtis Plant.

In this connection a fact not generally known is of interest. The two types of peppers which comprise the bulk of the chilis are Mexican and Californian. They differ slightly in appearance. From these two types practically all the chili powder and chili products are produced. The powder derived from them would be exactly the same if they were all dried under exactly the same conditions of heat and ventilation. In addition to the chilis and the fiery little "Capsabell" a vast quantity of pimientoes are produced in this locality and in the other counties where climatic conditions are right. At Long Beach, at the Stewart and Curtis Packing Plant, the methods of removing the skins from the pimientos is unique. The process now employed has been evolved from many experiments in this plant, but always the manner of loosening the skins has been by means of gas flames.

Course of Peppers

The peppers come in 60 and 70 pound bags, and after being weighed are put into a hopper and elevated to a grader. From the grader, which rejects the undesirables, the peppers fall out on to a shaker, an ingenious arrangement which shakes the peppers into each of the 20 roasters, forty feet long, arranged in a row outside the buildings. An endless conveyor chain carries the peppers through a tunnel arched over with fire brick. At the opposite end from where the peppers enter a gas flame is shot in at 30 pounds pressure, keeping about four-fifths of the roaster at a red heat. The almost round peppers are kept tumbling about so that they heat evenly.

Natural gas is used, and after trying several other fuels for loosening the skins, such as oil, etc., the company has found gas to be by far the best.

During the process water is sprayed onto the conveyor chain and the peppers, a beautiful red when they go in, come out in a stream, of dirty black water. They are then washed before they go to the cleaning room from where they emerge as lovely as ever, seeded and ready for canning. The same water which is sprayed on the chain which carries the peppers on their journey through the roaster also serves to transport the roasted peppers to another section of the plant for other processing.

The season lasts from September to about the first of January and about 3000 sacks per day is the average amount of pimientos taken care of in a season. The gas bill of the company for this branch of their business is an average of $1000 per month. This includes drying chilis in the four huge roasters, 18 feet long and 5 feet in diameter. These roasters which turn out 1200 sacks of product per day are each equipped with two gas burners.

Noise Lowers Efficiency and Menaces Health

NOISE throws the air into vibrations which beat upon the auditory nerves of the ears. These helpless nerves of hearing thus receive actual material blows. If those blows increase, the nerves become irritated and not only decrease the efficiency of workers, but result in disease.

At a recent meeting of the Acoustical Society of America, the members were told that noise reduces the efficiency of employees as much as 10%. Moreover, it was pointed out that a noise equivalent to heavy elevated traffic or loud radio music in a room decreases the normal contractions of the stomach 37% in one minute and sometimes causes a change in the manner of contraction.

Diseases of the ear are said to be increasing due to the increase in noise. The eyes can close against brilliant light, but the ears are not so protected. The helpless ear is the shortest avenue to the brain and the question is raised by scientists whether it may not be possible that much of the startling increase in insanity is due to the continuous noise which one must hear.

There is not much that most of us can do to decrease the noises from automobiles, trolley cars, whistles, bells and other street noises. But employers can do much to lessen the noise their employes must bear. They can install acoustical treatment in the office to quiet the noises of typewriters, etc.; they can install an air filter on compressors and Diesel engines to muffle the intake and exhaust noises, and make other simple inexpensive changes to materially lessen noise.

Our American cities are alive with avoidable noises. How long will it take us to teach the healthfulness of quiet? Not very long if employers were to realize the truth of the statement that noise lowers the efficiency of their employees 10%.

Gas Makes America's National Drink

How cleanliness and economy are effected in the soft drink plant

LAWRENCE E. BIEMILLER
and
FULTON D. MACNEAL
Consolidated Gas Electric Light and Power Company of Baltimore

DR. Philip S. Physick, a physician in Philadelphia at the time of the Revolution, became interested in the medicinal properties of carbonated water and requested Mr. Speakman to invent apparatus to produce it on a large scale. This was so successfully done, and the resulting carbonated water proved so beneficial, that its use by Philadelphia doctors became widespread. Many prominent Philadelphians developed the habit of visiting Speakman's shop daily for a glass or two of carbonated water.

Although Speakman was a good pharmacist and somewhat of an inventive genius, he was also a canny business man and realized that if his drink could be made more palatable, the demand for it would increase. Accordingly, he flavored it with fruit juices. This was the birth of the carbonated beverage industry.

Crude Methods

A few years after Mr. Speakman made his first "soda water," bottled carbonated beverages started to appear. The output was small and the method of manufacture crude. The ingredients were prepared by hand; the hand-made bottles were washed by hand in a tub; the water was drawn by hand from a cistern and the cork stoppers were wired in by hand. Little or no care was used in the picking of ingredients, and while cleanliness was aimed at, sterilization certainly was not obtained by these crude methods.

Gradually the industry grew and with its growth developed high ideals of quality and sanitation. From the crude hand methods used at the beginning, the modern plant of today has emerged with its laboratory, where all ingredients are tested, its modern mixing machinery by which the ingredients are mixed in sterilized vessels, its bottle soaker where bottles are washed, brushed and sprayed automatically, its pure liquid gas of the highest quality, and its cork-lined metal caps which hermetically seal each bottle.

Today the bottled carbonated beverage may well be called "America's National Drink." Last year more than twelve billion one-half pint bottles of carbonated beverages were consumed in the United States—enough to fill a reservoir of 750,000,000 gallons to overflowing or equivalent to 100 bottles for each man, woman and child in the United States.

Sanitation in the modern beverage plant is a primary requirement for two reasons: First, because beverages are regarded as a food product by Federal and State authorities and come under their supervision and regulation; and, second, any contamination or any vegetable life will cause the drink to spoil before it is marketed.

The fuel problem in the bottling plant is an important one. Due to the stringent demands for sanitation, the fuel must be clean and must be easy to burn, leaving no soot. Ashes, dirt and dust must not be tolerated, for these may contaminate the beverage. The fuel supply must also be dependable, since it is impossible to run the plant without hot water.

Gas is peculiarly adapted to meet the fuel demands of the bottling industry. Its cleanliness, its compactness, its dependable supply all go to make it the ideal fuel for the bottler. Its uses are many and varied throughout the plant. The cooking of syrups, the "thawing" of carbonic gas tanks, its use in the laboratory, and most of all its use in furnishing hot water and steam for bottle washing and the sterilization of equipment has caused it to become an old friend and ready helper to the bottler. The General Beverage Company's Baltimore plant is an example of a completely modern bottling plant that uses gas exclusively as fuel.

Economy Factor Uppermost

The General Beverage Company was organized with the purpose of producing high quality drinks at low prices. To do this every item of expense in the entire business was cut to a minimum. Certain guiding policies were set down and followed organizing the plant so that High Rock Beverages could be made from highest quality ingredients for the smallest amount of money.

First of all the overhead expenses were kept down. There was no waste space in the plant. Every square foot of floor space had a duty to perform. The machinery was the very best; it was durable, strong, and

dependable. There was no room for spare machinery because spare machinery increased the capital invested, which was to be kept to a minimum. Each piece of equipment was of highest quality because a failure of one piece thereof would stop the entire plant.

From the start this organization realized that gas was the ideal fuel. They used it to heat water, to "thaw out" acid tanks and to heat the solution in the bottle soaker.

The Gas Man to the Rescue

For some years bar burners were used to heat the solution in the soaker. These were controlled manually, and it was seldom that they were shut off, burning usually 24 hours per day. The firm decided that their gas bills were too high and the water in the soaker was seldom up to the desired temperatures.

Due to their former contact with the representative of the Gas Company, they called him and told him of the dissatisfaction with their soaker operation. They advised that they planned to secure from oil and coal equipment companies recommendations for equipment and estimated operating costs for heating the soaker.

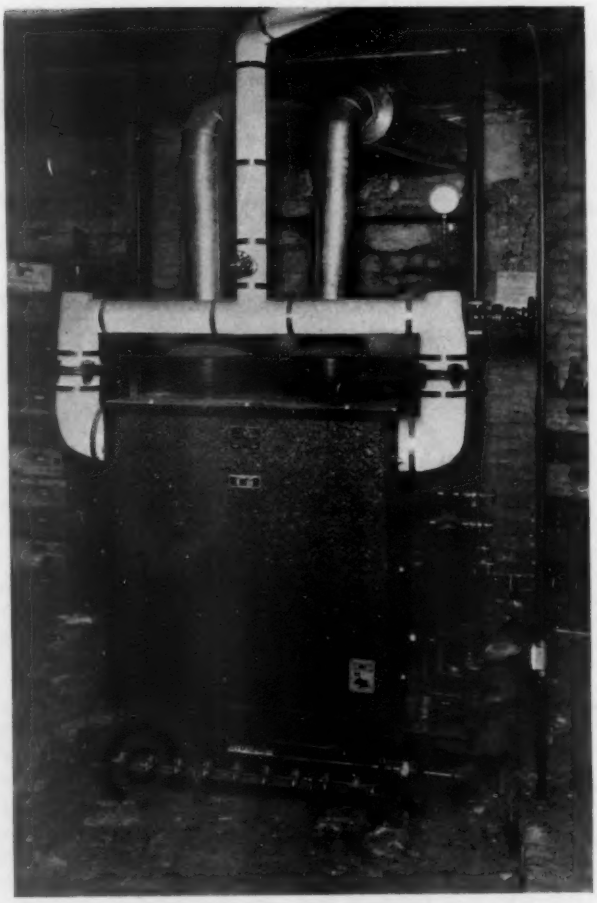
Upon investigation it was found that the labels collecting on the bottom of the soaker insulated the water from the heat and caused the bottom of the soaker to become unduly hot, forming scale which shortened the life of the bottom plates. The soaker was already equipped with steam coils and designed for steam. However, when the soaker was installed, due to a lack of space and an effort to decrease the investment in plant equipment, bar burners had been substituted as a source of heat. After some consideration, the General Beverage Company now decided that steam coils would be the best method of heat application since they would be submerged in the solution in the soaker and could not be insulated by the accumulation of labels. Accordingly, estimates were secured based on the use of steam boilers with gas, oil and coal fuel.

From the point of view of equipment cost, coal was cheapest, but this fuel was excluded because of the space required for coal storage, the dirt caused by the ashes, and the time consumed in firing and in ash removal.

With oil, the cost of sinking a storage tank was a considerable item, causing the cost of equipment to equal if not exceed that of gas-fired equipment. Oil was also regarded as being less dependable than gas and it was feared that it would require more time for adjusting and servicing the equipment.

Aside from cleanliness and compactness the absolute automatic controls offered by gas caused this fuel

Thermostat and Motor Valve on Soaker



Automatic Low Pressure Gas Boiler at the High Rock Plant

to be chosen. Although the fuel cost alone was apparently more there were savings due to less labor being required and constant temperature being maintained. This thermostatic control also showed a saving of bottles and assured sanitation, for if the temperature of the solution in the soaker were allowed to become too high, bottles were broken due to too rapid expansion, and if the temperature dropped too low, sanitation was not obtained.

The soaker to be heated was a "Cleveland" two-tank 60 bottle per minute, quart soaker, having a total solution capacity of 756 gallons. The estimate of the heat requirements were based upon the following calculations.

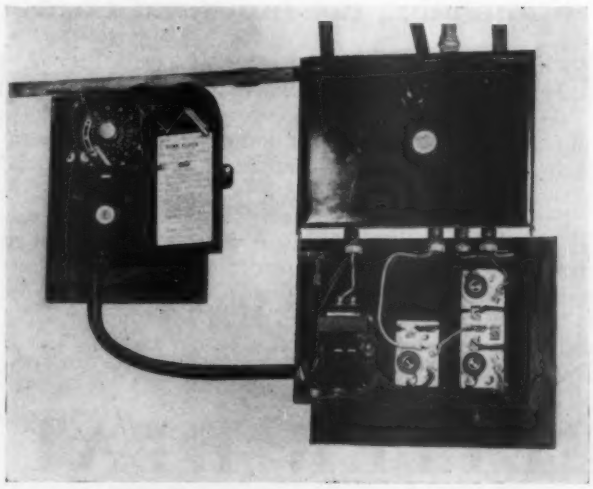
Calculating Heat Requirements

The maximum hour, it was assumed, would be one in which it was necessary to raise the temperature of the bottles 70 degrees Fahrenheit when the room temperature was 40 degrees Fahrenheit, and when the metal carriages which carried the bottles dropped 70 degrees Fahrenheit in their travel from the outlet of the soaker through the rinser and back to the inlet of the soaker.

1. Heat required to bring bottles to temperature.

The heat required to bring bottles up to temperature was calculated by using the following formula:

$$S \times W \times H \times T = \text{Heat required.}$$



Tork clock and electric fuse box controlling Solenoid and Motor Valves

Where:

S=Speed of soaker expressed in bottles per hour.
W=Weight of one bottle expressed in pounds.
H=Mean specific heat of glass.
T=Temperature rise expressed in degrees Fahrenheit.

Heat required to bring bottles to temperature is expressed in B.t.u. per hour.

$3600 \times 1.6 \times .2 \times 70 = 81{,}200$ B.t.u. per hour to bring bottles to temperature.

2. *Heat required to compensate for radiation losses from soaker.*

The soaker contained 84 sq. ft. of radiating surface in its sides. The radiation losses were calculated by substituting in the following formula:

$$A \times T \left[0.7 + \frac{T}{375} + R\left(1 + \frac{T}{300}\right) \right] = \text{Heat required.}$$

Where:

A=Area of radiating surface expressed in sq. ft.
T=Temperature difference between water and room temperatures expressed in degrees Fahrenheit.
R=The relative radiating power of metal compared to a perfect "Black Body," in this case taken to be 0.2.

Heat required is expressed in B.t.u. per hour.

$$84 \times 70 \left[.7 + \frac{70}{375} + .2\left(1 + \frac{70}{300}\right) \right] = 6{,}668 \text{ B.t.u}$$

per hour.

3. *Heat required to heat metal carriages as they pass through soaker.*

From the dimensions of a carriage and the number of carriages passing through the soaker in an hour, it was determined that 11,809 lbs. of steel per hour passed through the soaker.

Then substituting in the formula:

$$W \times H \times T = \text{Heat required.}$$

Where:

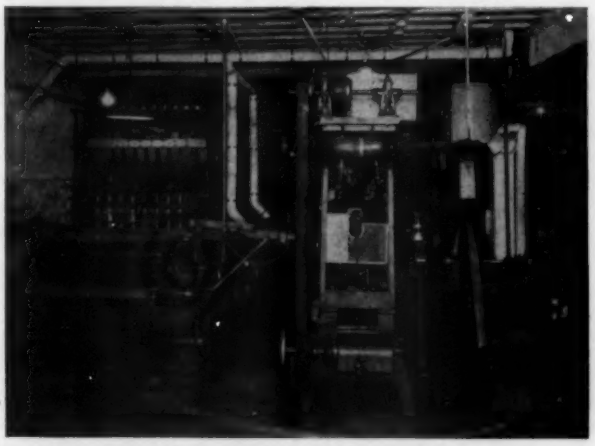
W=Weight of steel expressed in lbs.
H=Mean specific heat of steel.
T=Temperature rise expressed in degrees Fahrenheit.

Heat required is expressed in B.t.u. per hour.
$11809 \times .2 \times 70 = 165{,}340$ B.t.u. per hour required to heat carriages.

Collecting these requirements, we find a total loss of 253,208 B.t.u. per maximum hour.

1.	Heat lost in glass	81,200 B.t.u.
2.	Heat lost through radiation	6,668 B.t.u.
3.	Heat lost in carriages	165,340 B.t.u.
		253,208 B.t.u.

A 9 h.p. low pressure boiler was chosen, allowing a little excess capacity to be safe in case any of our assumptions were incorrect.



Bottle soaker and bottling machines

The radiation inside the soaker was then checked and found to be adequate, the first section having 12 sq. ft. of radiation and the second section having 18 sq. ft. of radiation.

Automatic Control Saves Labor

The customer wanted to have the system absolutely automatic. Therefore, equipment was recommended which would start the boiler in the morning before anyone arrived at the plant, and the desired soaker temperature would be obtained by the time the men reported for work. The temperature would be maintained at this point throughout the day and the boiler automatically shut off at the close thereof. It is easy to see that a large saving in labor results from such an automatically controlled system.

The system operates as follows:

A constant steam pressure is maintained by the pressure control mechanism on the boiler which cuts the gas off entirely, except the pilots, when a certain pressure,

in this case 10 lbs., is reached and then cuts the gas on again when the pressure drops, in this case at 8 lbs. An Arco motor valve is located in the steam line supplying each tank and is controlled by a thermostatic mercoid switch. A temperature of 90 degrees Fahrenheit is maintained in the first tank and a temperature of 130 degrees Fahrenheit in the second. A Tork clock operating through a solenoid valve in the gas line calls the boiler on at 6:00 a. m. and cuts it off at 5:00 p. m. To prevent an explosion hazard from existing should the clock call the boiler on when the pilot lights are out, a thermostatic pilot is provided in the boiler which prevents the flow of gas to the main burners unless the pilot is lighted. A low water fuel cut-off prevents the sections of the boiler from being damaged should the water become too low, for when the water line reaches a certain minimum, a float drops cutting off the gas supply to the burners. As all condensate is returned to the boiler, no feed water devices are used.

When the quotation for this equipment was submitted to the customer, he was a little doubtful whether to accept it or not. If oil equipment were used and proved unsatisfactory, he could remove the oil burner and place grates in the boiler and use coal, but with gas a specially designed boiler prevented his using any other fuel.

The Gas Company's Guarantee

The Gas Company believed that this application was economical and offered to guarantee the operating costs estimated on the basis upon which the boiler size was calculated. The guarantee read:

"At any time designated within 30 days after the installation of the boiler, we will run a test for three consecutive days, as follows:

1. Start with water at 60° Fahr. in the soaker.
2. Bring water up to desired temperature, i. e., 90° for the first tank and 130° for the second.
3. Run for a period of 12 consecutive hours, passing 45 bottles per minute through the soaker.
4. During this period, the gas consumption is not to exceed 4,000 cu. ft. for the 12 hr. run.

If the boiler does not meet the requirements, as specified in the test, it will be removed and the cost of the boiler be refunded. However, the General Beverage Company will pay for the piping, installation, thermostats and Tork Clock whether the boiler is removed or not."

Upon this basis the order for this equipment was received. Although the actual test was run under slightly different conditions, this gas consumption was checked. The bottles were run through the soaker at a rate of 48 per minute instead of 45, and a gas consumption of 4200 cu. ft. per day was recorded instead of 4,000 cu. ft. This estimate was checked more closely than will normally be the case.

One difficulty was encountered in connection with this installation. Originally the thermostats were installed quite low in the soaker. It was found, however, that labels collected on the thermostat bulbs, insulated them from the water, and caused the thermostats to operate very sluggishly. They finally had to be moved high near the surface of the water. Here the movement of the carriages causes sufficient currents in the solution to carry the labels past the thermostat bulbs and efficient control has been gained.

The bottling business is one where the advantages resulting from such an automatic gas system as here described are appreciated.

Stimulating the Industrial Load

"BETTER HEAT" is the name of a new four-page illustrated periodical that is now being published by the Consolidated Gas Company of New York to stimulate the use of gas for industrial heating operations, and to supplement the work of the industrial salesmen.

"Better Heat" is an extremely flexible mailing piece, and represents the development of a new wrinkle in publications of this nature, according to Henry Obermeyer, assistant to the vice-president of the company. The first two pages are devoted to a discussion of a specific heating problem in the reader's own line of business.

BETTER HEAT

"If it's done with heat, you can do it better with gas"

APRIL, 1930

Modern Heating Effects Large Saving in Ham Boiling

Specialized Appliances Developed by Gas Engineers for Bohle, Inc.

THE economy of gas fuel is not always measured in terms of dollars and cents; gas invariably saves money because it is the clean, flexible and automatic fuel. But in the case of Bohle, Inc., the Bronx, New York City; they have proved to their complete satisfaction that gas fuel effects an actual cash saving of $166.80 per month, or $2,001.60 per annum, as com-

Table Showing Actual Test at Bohle Plant

Ham Boiling Tank 10' x 45" x 37"
(Operating half capacity)

To heat water in tank to 180° F. (processing temperature)	Gas 1,200 cu. ft.
To hold heat at 180° F. for 6½ hours	1,600 cu. ft.
Total gas consumption	2,800 cu. ft.
Grand total (operating two tanks of equal dimensions)	4,400 cu. ft.
Cost of 4,400 cubic feet industrial gas	$4.40
Cost of gas (operating 28 days per month)	$123.20

Cooking Tanks Heated with Immersion Gas Burners

pared with solid fuel. This firm recently erected a modern plant for boiling hams, corned beef, and other meats, in the preparation of a well-rounded line of delicious food products supplied to more than 500 delicatessen shops in New York and vicinity.

Before gas was installed at the Bohle plant their own estimate, based on actual knowledge and experience with steam boilers, showed operating expenses, including a licensed engineer whom they would be compelled to employ at $150 per month, and the minimum charge of $120 per month for coal and $30 per month for ash removal, aggregated $290 per month, or $166.80 per month more than the actual cost of gas fuel for the same operation. In this manner the Bohle firm arrived at the estimated figure of $2,001.60 as their annual saving by the use of gas.

The Bohle tanks are equipped with Ensign-Reynolds Stoylite burners and immersion coils, with gas supplied at a maximum of four pounds pressure by rotary air-cooled compressors with bypass relief valves built into them, and high pressure gas injectors, providing an air-gas mixture for complete combustion at all rates of burning. Heavy insulation around the tanks conserves the heat for economic processing. This insulation is also most effective in keeping the plant cooler in the summer.

At the Bohle plant evenly cooked hams are the first consideration. The possibility of overboiling or underboiling is safeguarded against the human element of uncertainty by the constancy of gas heat. Underboiling creates dissatisfaction among customers, overboiling causes waste and consequent loss in profits, since the hams are sold by weight. If there should be a shrinkage of an eighth of a pound per ham on a batch of five hundred hams weighing 10 pounds each, this loss would aggregate 625 pounds, or the equivalent of sixty-two and a half hams.

Overboiling also makes the hams streaked, as the overcooked fat has a tendency to penetrate the lean. This is another cause for complaint.

"The first issue is being published in three editions," Mr. Obermeyer says. "The leading article in these editions deals respectively with gas installations in photography, in lacquering, and in preparing food products."

The third page of "Better Heat" contains general information on gas heat for factory purposes, and the fourth page is devoted to technical data on industrial gas rates and a code for the proper maintenance of widely used gas equipment.

An insert wrapper was slipped around the first issue, with the following message:

"'Better Heat' a service published by your Gas Company in the interests of fuel users in productive enterprises. The first page of 'Better Heat' is devoted to a heating problem of your own, or a similar line of business. We suggest that you read this article carefully, as it may contain timely information that will improve your output and possibly increase the operating efficiency of your plant. Our engineer can be called upon at any time to conduct a survey of your plant. No obligation. Use the enclosed card."

Cheerful Credit and Sane Collections

Observations of a Gas Customer on Credit Practices and Collection Procedures

H. T. EAST

Assistant to Vice-President, Public Service Company of Northern Illinois, Chicago

Comfortable Pleasant Surroundings with Individual Desk Contacts Are Desirable for Credit Departments

"I AM an average person. Although they say no two people are exactly alike, in common with most everybody else I have certain likes and dislikes and live much the same as other Americans of my type and circumstance. I like to be treated well and naturally trade where I am given most consideration and best attention. I am a user of gas, but being only one of 12,000,000 gas customers in the United States this is no mark of distinction. If I were to be asked why I became a customer of a gas company I would probably answer, 'Most everybody seems to cook and heat with gas. It was available in the premises when I moved in and I had it turned on along with the water, electricity, telephone and other things we moderns use.' To tell the truth I never gave my order for gas any more thought than I do the buying of groceries, meat or any merchandise. My business relationship with the gas company is a minor and very ordinary business transaction, if indeed it could be dignified by such a name. I most certainly don't consider it any special privilege to use gas.

Inconvenience, Annoyance and Amusement

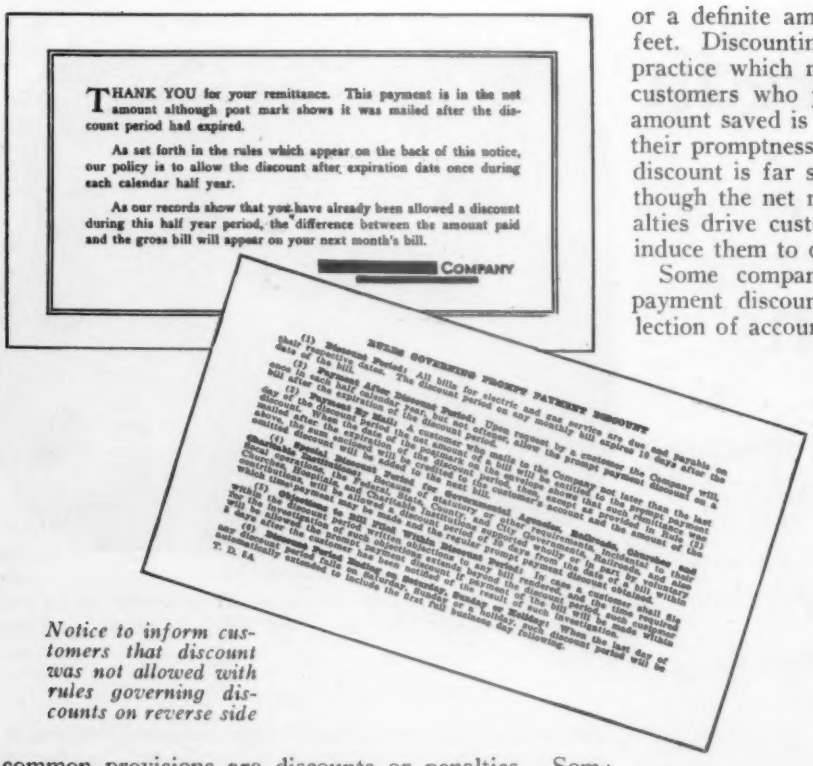
"My experience as a gas user has been long and varied. Forty years ago I moved into a gas lighted apartment and since then I have moved dozens of times to new homes and into different cities and nearly always I have been inconvenienced, annoyed and, yes, even amused at the red tape, dignified procedure, and laborious poppycock which gas companies have attached to a transaction which I consider as simple as buying any other commodity for which the charges do not exceed a few dollars monthly. True enough, conditions have improved during the years and I have noticed that utility companies have come to understand the value of good-will and have improved service, reduced rates, and humanized many of the procedures which involve their patrons. Yet many still cling to archaic practices, particularly in matters of credit and collection, which moves applicants for service to shout 'Why all the fuss? It's gas I want, not a thousand dollar loan.' For in many cases the steps necessary to become a customer are involved and stupid and make us wonder whether we are favoring the company with business or being reluctantly accorded a special privilege which we should never have expected to receive.

"Any survey of the credit policies and collection practices of gas companies will surely reveal foundation opinions such as I hold. It seems that credit and collection departments have been slowest to realize that business organizations, particularly the utility businesses, have entered a new era, the era of friendly service. One evidence of this sluggishness is their retention of heavy iron grilled cashiers' cages that would defy a dynamite squad while the new bank across the street has done away with such alleged 'protection' entirely. In all probability conditions which are subject to criticism have been unthinkingly retained as a relic of bygone days and will shortly be changed by the more progressive companies at least."

The foregoing attitude is more or less typical of the general opinion held by many representative gas users. This was determined by detailed inquiry, study and analysis of many customers. Doubtless more people would feel the same way were it not for the happy fact that credit contracts are usually limited to new customers and collection abuses to the minority. Should any doubt that present collection and credit tactics are too harsh and uncompromising, and many of those in charge of such activities will doubt it, they only need examine copies of the forms now in use by a dozen or more gas companies to find mute testimony in support of the charge. The subject of effect of credit and collection activities upon customer relationship at least deserves analysis and study which is the purpose of this writing.

Rates Which Aid Bill Payment

Since all credit and collection activities have as their ultimate purpose the gathering of money due the company for gas sold at established rates, the rate structure is the logical place to begin consideration of the subject. Most rate schedules are designed in part to facilitate collection of bills. This purpose is carried out by adding some inducement to prompt payment. The most



THANK YOU for your remittance. This payment is in the net amount although post mark shows it was mailed after the discount period had expired.

As set forth in the rules which appear on the back of this notice, our policy is to allow the discount after expiration date once during each calendar half year.

As our records show that you have already been allowed a discount during this half year period, the difference between the amount paid and the gross bill will appear on your next month's bill.

[redacted] COMPANY

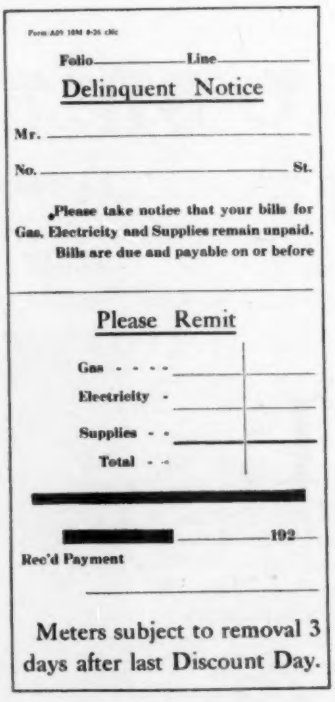
RULES GOVERNING PROMPT PAYMENT DISCOUNT

Notice to inform customers that discount was not allowed with rules governing discounts on reverse side

common provisions are discounts or penalties. Some favor the penalty provision under which bills which are not paid within a fixed period automatically increase a certain amount. This plan has advantages from an accounting standpoint but differs from accepted business practice and is often misunderstood by customers. Without question "penalty" is a distasteful word.

A more common provision is the discount clause in rate schedules under which a certain saving is offered customers who pay their bills promptly. Discounts may be a fixed sum per bill, a percentage of the total, or a definite amount per unit, as 10c per 1,000 cubic feet. Discounting of bills conforms to general business practice which makes it more readily understood and customers who pay their bills promptly feel that the amount saved is a premium which they have earned by their promptness. From a psychological standpoint the discount is far superior to the penalty arrangement although the net result in either case is the same. Penalties drive customers to pay on time while discounts induce them to do so.

Some companies have neither penalty or prompt payment discounts and although this makes the collection of accounts more difficult the idea has consider-



Folio_____ Line_____

Delinquent Notice

Mr. _____

No. _____ St.

Please take notice that your bills for Gas, Electricity and Supplies remain unpaid. Bills are due and payable on or before

Please Remit

Gas - - - -

Electricity -

Supplies - -

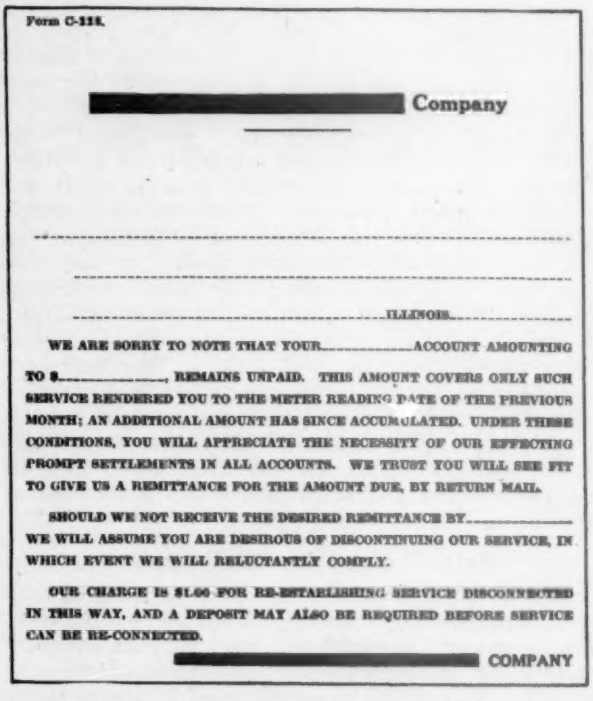
Total - -

[redacted] _____ 192__

Rec'd Payment

Meters subject to removal 3 days after last Discount Day.

Delinquent notice With Implied Threat



Form C-118.

[redacted] Company

_____

_____

_____ ILLINOIS.

WE ARE SORRY TO NOTE THAT YOUR_____ACCOUNT AMOUNTING TO $_____, REMAINS UNPAID. THIS AMOUNT COVERS ONLY SUCH SERVICE RENDERED YOU TO THE METER READING DATE OF THE PREVIOUS MONTH; AN ADDITIONAL AMOUNT HAS SINCE ACCUMULATED. UNDER THESE CONDITIONS, YOU WILL APPRECIATE THE NECESSITY OF OUR EFFECTING PROMPT SETTLEMENTS IN ALL ACCOUNTS. WE TRUST YOU WILL SEE FIT TO GIVE US A REMITTANCE FOR THE AMOUNT DUE, BY RETURN MAIL.

SHOULD WE NOT RECEIVE THE DESIRED REMITTANCE BY_____ WE WILL ASSUME YOU ARE DESIROUS OF DISCONTINUING OUR SERVICE, IN WHICH EVENT WE WILL RELUCTANTLY COMPLY.

OUR CHARGE IS $1.00 FOR RE-ESTABLISHING SERVICE DISCONNECTED IN THIS WAY, AND A DEPOSIT MAY ALSO BE REQUIRED BEFORE SERVICE CAN BE RE-CONNECTED.

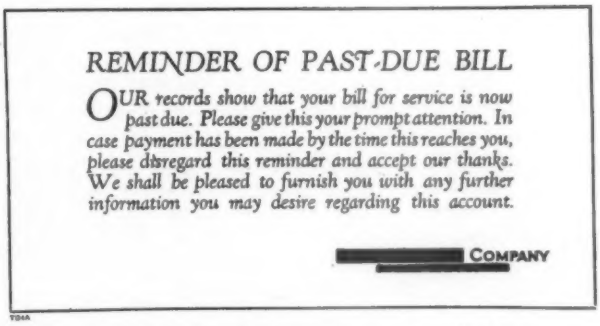
[redacted] COMPANY

Service discontinuation notice with explanation

able merit. In fact there appears to be a slight trend in this direction. One of the country's largest holding companies is now seriously considering a straight rate without any penalty or discount feature. The rate is straight as is the case with other commodities which the customer buys regularly and collection is made in the ordinary way. That part of the rate schedule which is designed to promote bill payment should always be carefully considered from the standpoint of its effect upon customer's attitude before a decision is reached as to the provisions to be adopted.

Discount Allowances

Where discount or penalties are provided in the rate schedule a considerable number of those who pay late will seek to have the discount allowed. Numerous reasons why exceptions should be made in their particular case will be presented. Opinion differs widely as to how this delicate matter should be handled. Some companies make it an absolute rule not to allow discounts after expiration date while others are very lenient and accept almost any excuse, such as illness or quarantine, admitted inability to pay in time, payments only a day or two late, bill not received in time, and so on. Judgment is passed by the cashier or adjuster in each individual case. Where such a policy is followed the company is placed in a position of dis-



REMINDER OF PAST-DUE BILL

OUR records show that your bill for service is now past due. Please give this your prompt attention. In case payment has been made by the time this reaches you, please disregard this reminder and accept our thanks. We shall be pleased to furnish you with any further information you may desire regarding this account.

[redacted] COMPANY

Politely Phrased Reminder or First Notice

senting the best argument and against those who may be more deserving but less persistent. Such a policy is obviously unjust.

To avoid discrimination it is necessary to have a definite method of handling such requests, for experience shows that even with qualified adjusters discrimination and unfairness will attend efforts to judge each individual case on its merits. One solution is to allow one discount during each year or during each half calendar year upon request. It is a recognized fact that even the most honest and sincere customer will occasionally fail to pay his bill on time. The fundamental purpose of the discount plan is not to penalize such customers but rather to insure the habit of prompt payment. By allowing one discount upon request during an established period allowance is made for occasional slips, yet all customers are treated alike and the rule may be applied uniformly without passing judgment on each individual case. Customers are quick to see the fairness of such a rule. The plan works out very satisfactorily and is far superior to the hit and miss method of passing upon the honesty and weight of reasons advanced by customers.

Discounts are usually extended when final date falls on Sunday or a holiday. Most companies accept mailed remittances which bear postmarks within the period and some accept net payments over the counter at offices until noon on the following day so as to avoid discriminating between mailed and personally presented remittances.

A simple card record can be used to determine which customers are entitled to discount and if this record is arranged to show only the names of those who have received the allowance the file will be much smaller than one with all customers represented.

Where payments are received in the net amount from customers who are not entitled to the discount the customer should in each case be notified that the allowance cannot be made with reasons therefor to forestall a complaint when the next regular bill goes out with discount added. This can be accomplished by a politely phrased printed notice which states that the payment arrived too late and that the gross amount was therefore payable, adding that the amount of the discount will appear on the next month's bill. If reasons for the actions are included much undeserved criticism may be avoided.

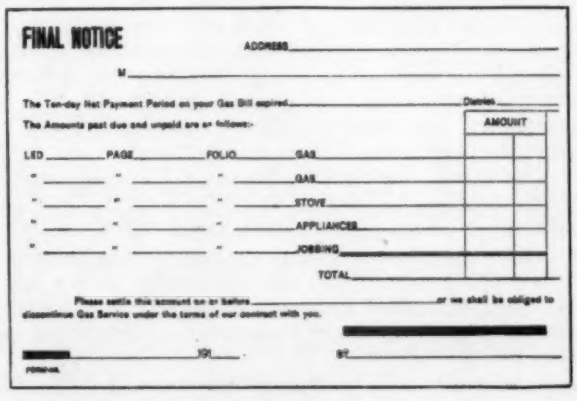
How We Got That Way

The necessity for charging for the service supplied is one of the greatest handicaps to perfect customer relations in the utility field. That these charges must be billed long after the commodity has been furnished to and used by the customer is another handicap. The gas business is inherently a credit business and being of monopolistic character must supply everyone that desires service. These facts were responsible for steps which were early taken to protect gas companies from losses due to failure of customers to pay for the service furnished them. To ascertain the financial responsibility of those applying for service before connecting them was a logical move. Despite the credit inquires and the practice of depriving the delinquents of service losses still occurred and in their zeal to get everything due them companies began to lean over backward. When Public relations began to receive attention treasury departments continued to feel that the necessity for iron clad protection outweighed everything else.

It apparently mattered not that the rates charged, as in other businesses, allowed for a reasonable total of uncollectable accounts or that good money was being spent in various ways to build good-will which stringent short sightedness in credit matters was tearing down. And so developed a Simon Legree attitude in the minds of the average credit man and collector which, though less pronounced than before, still exists. How incongruous it must seem to a customer to read a good-will advertisement in the paper, listen to a pleasant meter reader boost his company's service, or have a complaint courteously handled, and then to be confronted with a Shylock from the same company with his insistent, threatening and uncompromising demands for the pound of flesh.

The Commonsense of the Problem

Customers should pay their bills, but let us not forget that delinquency is in the majority of cases a temporary state which will later be overcome and, further, that as yet no law has been passed making delayed payment a criminal offense. The problem of collecting bills due and insuring payment of future bills is therefore one which must be considered from other than selfish angles. This does not mean that extreme leniency in such matters be practiced, for good-will purchased by allowing undeserved concessions is dearly bought, but that procedures be modified and humanized. That there is a middle ground with many advantages is proved by the splendid collection records of several companies with liberal policies and yet others still contend that policies liberal enough to gain good always lead to excessive losses.



FINAL NOTICE

ADDRESS _____

M _____

The Ten-day Net Payment Period on your Gas Bill expired _____ Dueber _____

The Amounts past due and unpaid are as follows:-

AMOUNT

LED _____ PAGE _____ FOLIO _____ GAS _____

" _____ " _____ " _____ GAS _____

" _____ " _____ " _____ STOVE _____

" _____ " _____ " _____ APPLIANCES _____

" _____ " _____ " _____ JOBBING _____

TOTAL _____

Please settle this account on or before _____ or we shall be obliged to discontinue Gas Service under the terms of our contract with you.

[redacted]

[redacted] FOR _____ BY _____

FOREMAN

Straight Final Notice

The average American is touchy about his credit and above all does not like to be questioned concerning it in the presence of others. All credit information should

be solicited in private. The preferred arrangement for credit departments is desks where credit man and customer may be seated during the interview. If counters are used customers may be standing around in line which can overhear the conversation. It is desirable not to request more information than is absolutely essential and this does not require more than a few well pointed questions. As a rule the applicant's record at previous service address is all the information necessary. The average applicant does not resent a few intelligent inquiries regarding their credit but considerable antagonism may be aroused by exhaustive inquiries or enforcement of restrictions which are out of all proportion to the amount of credit involved.

It should always be borne in mind that most customers do not understand that the nature of the commodity furnished and the process of supplying it makes the gas business a credit business and therefore different from others. If the reasons for inquiries regarding credit were briefly and tactfully explained misunderstandings and ill feelings would be avoided. By closely watching new accounts and then referring those who prove by failure to pay promptly that they are not good risks to the credit department many companies have found it possible to serve residential customers in most types of territory without making any credit inquiry.

Strange as it may seem, some companies still refuse to connect a customer until they have assured themselves of the applicant's credit responsibility or protected themselves by obtaining a guarantee of some kind. This is a short sighted policy that no company with an honest desire to serve their patrons will continue, since the maximum risk involved in furnishing gas immediately is the loss of a few days service while all applicants, the honest as well as the few others, are seriously inconvenienced by such delays and naturally develop a bitter feeling toward the company. If it is later found advisable protection may be requested and service discontinued for failure to respond. When it is impossible to obtain all the information needed at the time of application an investigation can be made while the machinery of establishing service connection continues without interruption.

Protecting Accounts

Like any other business we will always have some customers with such poor credit records that it would be a needless risk to serve them without protection. But can we afford to adopt the principle of a naval court and consider everybody crooked until proved honest, or should we consider our patrons as honest until we are forced by experience to believe otherwise? The methods most commonly employed to protect bad risks are guarantors and cash deposits. Any analysis of the guarantor method will lead one to wonder why it was ever adopted. Under this plan some friend or neighbor of the applicant is requested to go bond for the payment of any and all bills contracted. Guarantees are not usually requested from customers with unquestioned credit, which means that customers who do not fall in this class are asked to approach neighbors, friends, or acquaintances with the prayer that they guarantee payment of their bills.

Human nature here enters into the transaction and many persons reluctantly sign the guarantee who would much prefer not to do so. They merely sign to avoid offending a friend or neighbor. Thus the gas company has been instrumental in involving a third and disinterested party in a transaction in which they could hardly be expected to have any natural interest. A guarantee means little unless the responsibility of the person signing it is investigated and found satisfactory. If delinquency occurs the company must demand payment of the guarantor. Arguments and even legal procedure are sometimes necessary to enforce the terms of the instrument and although the amount is often not collected the company is always certain to get the ill-will of an innocent third party. It is difficult to imagine a policy with more inherent and obvious drawbacks. Each customer should provide protection for his own account if his record shows that such protection is needed.

Advantage of Cash Deposit

The best and most commonly used method of protection is the cash deposit. The customer is required to deposit a sum large enough to cover an average bill for one month plus the period which must necessarily elapse before an account becomes delinquent, usually two and one-half months in all. The cash deposit is the best protection method from a standpoint of both customer and company. For the customer it is most confidential, requires no answering of personal questions, avoids delay and does not involve references to friends, while for the company it affords full coverage, is quickest and calls for a minimum of work and record keeping. Customers object, of course, to cash deposits but many of these objections can be satisfied by a proper explanation of the reason for the request; and the provisions under which it is taken and returned. All letters requesting deposits should also include a full explanation and not just merely request or demand for the deposit. Since cash deposits usually bear interest it is customary to issue certificates of deposit stating the terms under which the sum is accepted and held.

For economic reasons deposits ought to be refunded as soon as the customer has established his credit. Deposits are often refunded at the end of the first year if all bills have been promptly paid during the probation period. The unsolicited return of sums deposited makes friends for the company. Gas companies which enjoy the best relations with their customers are those which only obtain and retain deposits of residence customers who have proved themselves poor risks and commercial customers in the class of garages, restaurants and other small businesses which can and do frequently change hands quickly without notifying their creditors.

Collection Procedure

Let us review the normal procedure in the routine of supplying gas, billing and collecting for it. The meter is read on a certain date and the data sent to the customers' accounts department where a bill is prepared. Bills should always carry information as to where they may be paid, enough information to enable customers to check computations, and a prominently displayed statement that the discount expires on a named date. Cut-off threats or harsh statements have no place on bills as each patron is at least entitled to a chance before being warned or threatened. The bill arrives with the due date entered thereon, which establishes a period of grace during which the bill may be paid in the net amount.

In the meantime, of course, the customer is running up a bill for the subsequent period. Let us assume that the discount day arrives and passes and that the customer either through oversight or intention fails to remit. The bill then becomes payable in the gross amount or

an amount is added in the form of a penalty. A serious question immediately arises, one that has been stressed by competent lawyers in recent months, that is, where a discount is lost or penalty assumed has the customer not purchased the right to withhold the payment for some further period.

In the commercial field obligations met promptly earn a discount and in many instances, due to the current financial status of the debtor, payment is intentionally withheld because of the willingness to forfeit the discount for extension of time. If this reasoning is correct forfeiture of a discount entitles the customer to extended time in which to pay the bill and collection activities should not proceed at once.

The bill remains unpaid and a notice is sent. Here is an opportunity to display courtesy and kindliness without reducing the effectiveness of the messenger. Some companies send a first notice which fairly bristles with threats or implied threats and brusqueness while others, realizing that payment may have been merely overlooked, mail a politely phrased first notice. This first notice may even be called a reminder and made impersonal by using a printed form of pleasing appearance without the amount due entered thereon, for if the amount due is entered it becomes a dun which many people will resent, particularly those whose credit is satisfactory and who had some legitimate reason for not paying on time.

In case payment is still withheld, a final notice is dispatched, although some companies send a second or intermediate notice before the final one. The final notice must carry the information that if payment is not made by a certain date service will be discontinued. Even this can be extremely firm without being impolite. The case is then referred to collectors who follow it up by mail and personal call. Since collection tactics offer opportunities to make friends or enemies the work is highly important from a customer relations standpoint. Should the customer not have the money neither threats nor polite entreaties will bring payment, but courtesy and expressions of regret will create a better feeling toward the company.

Discontinuing Service

Gas companies have an excellent means of compelling payment, the right to discontinue service if bills are not paid. The obvious advantage of this weapon has caused it to be frequently misused. Too often this club is brandished to drive or frighten slow paying customers into line with overzealous collectors waving their wrenches on occasions where tact and diplomacy would better serve the purpose. Such action is oppressive and smacks too strongly of olden days for use in this enlightened age.

A study of cut-off procedure clearly proves that no advantage is gained by ruthlessly exercising the privilege. Instances are very rare where cut-offs executed in a vindictive or belligerent manner have brought payment more quickly than the discontinuing of service in a friendly, reluctant, and sympathetic manner. Cut-offs accompanied by apologies and expressions of regret at the necessity for the action produce good-will and frequently do much to bring about early payment of the delinquent account. That is human nature.

Gas company forms and notices and rules prove that penalties are often assessed customers who have been deprived of service in the form of inconveniences, delays in restoring service and reconnection charges. Many companies demand that such bills be paid in person, causing workmen to leave their jobs when they cannot afford to lose the time. Reconnection charges which exceed the cost of extra labor involved are made and a day or so of deliberate delay is frequently practiced.

Several companies refuse to accept payment at the service address after cut-off notice is mailed. These measures are purely punitive and evidence a vindictive spirit which belittles the offending company and makes enemies. Petty punishments are unbusiness-like and certainly are not becoming to a business with the high ideals the American gas industry possesses.

Cheerful Credit

Contrary to a rather general belief, a credit man need not be a cold calculating individual in any business and in the utility business he must not be of that type. Collectors partcularly should be trained to understand that they must be courteous and sympathetic in their work. The importance of training personnel to understand the need for displaying kindliness and sympathy toward customers in the contacts cannot be overemphasized. It has been demonstrated that such an attitude is productive of greater results than the hard boiled tactics once practiced to some extent. This fact cannot be emphasized too strongly.

Collection efforts become very trying at times and collectors may sooner or later become disgusted with customers who do not pay bills or keep promises. Persons who cannot handle contacts of this nature without developing personal antagonism toward the individuals they deal with have no business in such work.

The minute the head of a collection department develops an antagonistic feeling toward a customer he should no longer handle the case for in this frame of mind he is incapable of calmly surveying the circumstances and passing on the case with unbiased judgment. Likewise a collector who cannot remain calm, tactful, and courteous under all conditions is not the right man for his job. Good collectors possess common sense as well as tact and diplomacy.

A friendly attitude, mixed with kindly courtesy, sympathy and tolerance should prevail in credit and collection work. These attributes not only get bills paid but make friends for the company. Even when a collection matter proceeds to legal action, and this ought not happen often, although occasionally it is both necessary and desirable, there is no apparent reason why the action should not be considered and handled as a friendly suit. Such is the new order of things in an industry which must have the good-will and confidence of the public.

To All Gas Men:—

Jist to inform you that I am now on a vacation and am using it to visit a few gas plants here and there. I will snag a few good ideas for Sam and the rest of the gas folks and will unburden a bit later. Look for a blast from the hot valve in July issue.

Monoxide Mike

X-Gas For Househeating

AUTOMATIC heat is gas heat and only gas heat. It has been pointed out under "Characteristics of fuels" that of all fuels, only gas is in the proper form to burn. Further, that the control of heat is easiest and simplest when the fuel is gas. These are only some of the reasons which impelled the installation of over 100,000 gas central heating plants in 1929. Gas is not the fuel of the future, but the fuel of today. Compared with other gas appliances, over 10% as many gasheating installations were made as gas ranges, over 50% as many as self action water heaters, and far more than all gas refrigerators, laundry driers and incinerators. Selling gas for househeating is evidently capable of mass merchandising methods if suitably backed up by sound engineering assistance.

A Desirable Load

Central heating is one of the best and most desirable loads available for the present day gas company.

Its true load factor (the ratio of the actual consumption to the connected load) is among the highest of all appliances being surpassed only by the continuous absorption type refrigerator and possibly by the manually controlled two range burner storage water heater.

The average of the maximum load over the heating season is between 30 and 33% for the larger cities above the Mason Dixon line. This average load becomes 20% to 22% on a 12 months basis. Because of the allowances for quick starting, the actual gas demand is 50% greater than the theoretical, so that the actual load factor becomes ⅔ of 20 to 22% making a load factor of between 13 and 15%. A load factor of 3% is good for gas ranges and 10% for the self action water heater compares with this value for central heating. The load factors which surpass the heating load are the refrigerator value of about 53% and the two range burner storage water heater of between 20 and 80% depending on the water demand.

Central heating supplants the inefficient but generally used methods of lighting the entire gas range with its high burner consumption and builds up a daily load curve by burning during the light night hours, before and after the breakfast load, intermittently during the day and again after twilight with the cooler temperatures of the approaching evening.

The type of rate used for househeating must be simple to explain to the customer, represent the best contemporary thought in customer appeal, and produce economies to the utility. The actual rates depend not only on cost of gas production and distribution but also on the cost of competitive fuels. A two meter rate is simple to tell the customer, but extremely difficult to justify. It has the obvious disadvantage of making the customer feel he is at one and the same time a wholesale and retail customer. Finally, it means two meters supplying gas at two different prices, both being fed by the same service when it is probable that the meter supplying the boiler has ample capacity to care for the other domestic gas uses. In spite of the increasing adoption of this type of rate, it lacks customer appeal, adds to investment and operating costs and violates the basic principles of the Scientific Rate.

The block rate has its usual serious disadvantages. although it eliminates the investment costs of additional meters. It gives the customer the feeling of having his increased consumption valued by a reduction of price, and is simple to explain.

Drawback to Scientific Rate

The Scientific Rate with a single meter has the one drawback of this rate which is training the gas company employees to properly explain it. The manufacturing and distribution demand charges can be simply allocated to the basic unit of house heating, the square foot of the required radiation. The maximum gas demands for this unit are well known and setting the charge to be made for this part of the rate is a simple accounting matter. The commodity charge, applying to all gas used for any domestic purpose, is well established. This constitutes the second part of the rate. Such a rate is just to both customer and utility, produces the utmost economy in meter equipment, and has customer appeal. The commodity charge is usually far below the standard gas rates, and saving in money can be shown immediately on existing gas load which overcomes much sales resistance to an increased heating cost. It encourages the addition of gas appliances for other domestic purposes. Many water heaters, laundry driers and incinerators have been sold on the basis of the reduction in overall rate by the added gas consumption, all of which reacts favorably on the cost of heating.

Heating probably more than any other requirement of life is decided by preference. The choice of a heating system is wide and, when the selected system is properly installed, is satisfactory indeed. The rapidity of heating and low initial cost of the usual warm air systems appeal to some, the uniformity of heating over long periods of the hot water system is the deciding factor

NOTICE

During Mr. Apmann's absence in Europe any questions concerning this series of articles, which have been prepared exclusively for American Gas Journal, will be answered promptly by the Journal staff.

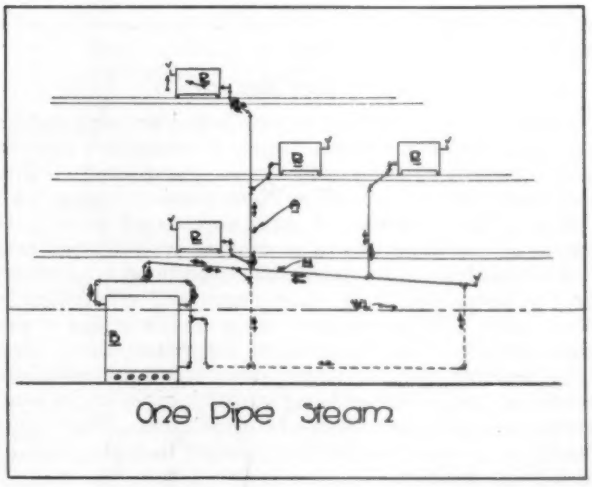


Fig. 1—One Pipe Steam System

to others, the improbability of freezing a steam system attracts still others, and this together with the flexibility of a vapor installation is the reason for the choice of the rest.

In the last analysis all of these methods of heating give comfort, the difference being in the means used. Central heating is accomplished by delivering a heated fluid (air, water or steam—either sub or super atmospheric) to the space to be heated. The heat of the fluid is transferred to the space and its contents, and then to complete the cycle, the cooled fluid is returned to the boiler or furnace for reheating. The ways in which the heated fluids are carried in each of the systems are quite different and the fundamentals can be quickly reviewed. The following descriptions are for the most popular systems, although many variations are found.

Steam Systems

There are three variations of the steam system, one pipe steam, vapor and vacuum. The one pipe system is recognized from the single basement main which carries both steam and condensation. Also, each radiator uses but one connection to the steam piping. Since the piping carries both steam from the boiler to the radiators and the condensed water from the radiators to the boiler, very often in opposite directions, it is essential that proper drainage be provided. The main is always pitched away from the boiler and to the return to insure rapid delivery of steam to the risers and radiator connections. As both steam and condensation are traveling in the same direction in the main (see arrows in the diagram) its pitch must be definite, but not nearly as great as that of the take-offs to the radiators. In these take-offs the steam flow is opposed by returning condensed steam, and consequently the pitch of these must be quite sharp. Trapped lines must absolutely be avoided as even a shallow trap will require a considerable increase in steam pressure to fill the radiators and will produce the hammer, hammer, hammer very often heard.

In the diagrams:

Drainage by proper sizing and sloping overcomes any conflict between the flow of steam and condensate but this does not permit the steam to flow freely against the air lodged in the system. With a cold boiler, the radiators, piping and upper half of the boiler are filled with air. Before steam can flow to the radiators this air must be expelled. Originally a manually operated valve was used on each radiator consisting of a small needle valve which allowed any fluid (air, steam or condensed water) to pass. In many cases after a short time, either the seat or the needle became worn and venting continued without manual attention. Steam and water in such cases were lost and caused considerable damage. The modern vent is one which remains open until the heat of the steam causes the valve to close, which prevents the escape of steam. If this valve is combined with a light float, water which may reach the vent valve will also shut it. With the air expelled, steam can then flow to the radiators, give up its heat, change to water, at the same time contracting in volume, and allow fresh steam to flow to the radiator. The condensate runs down the risers, through the main and is returned to the boiler where it is again turned into steam. As the amount of air originally in the system was large and the vent openings very small, an appreciable time elapses between the starting of the boiler and a good emission of heat from the radiator. If this system is allowed to cool, the thermostatic element of the vent valve will uncover the opening as it cools and air will be redrawn in the system, unless a back flow is prevented. Vent valves are therefore provided with a return check which does not permit a back flow. Obviously, with an effective valve, air is excluded and with no resistance the steam thereafter fills the radiators quickly, giving rapid heating.

A proper one pipe system will avoid traps, poorly pitched and small piping and have suitable quick vent and vacuum valves on every radiator and separate steam main. Attention to these details will "make" a one pipe system.

Vapor Systems

Vapor, the term given to gases at or near their boiling points, is also the name given to the two pipe steam systems operating at low steam pressures. Using the same nomenclature as that in the diagram of the one pipe system, it will be seen (Fig. 2) that the pipes are literally one way streets. Steam only flows in one of the pipes and air and condensed water are returned through the other to the boiler. The air is vented all at one point just before the condensate returns to the boiler, generally by a vent valve similar to but larger than those used in the one pipe systems. The air is therefore swept on by the incoming steam and never acts as a resistance to the steam flow. Each radiator has two connections to the piping system, the upper one coming from the steam lines, through a regulating valve if desired, and

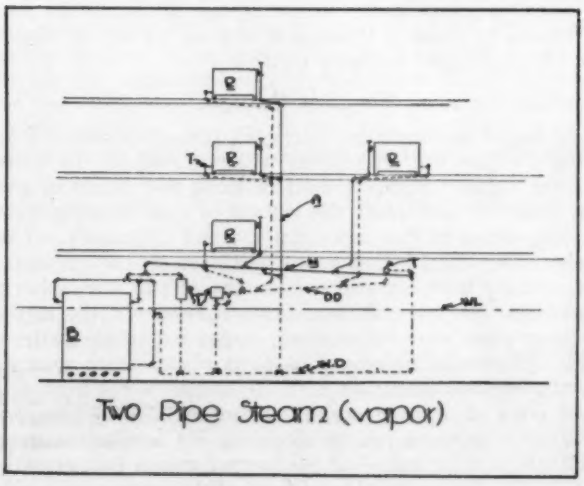


Fig. 2—Two Pipe Steam (vapor) System

the lower one feeding to the return lines. The lower connection is usually made through a thermostatic valve which remains closed by steam temperature, but opens at the lower temperatures of the condensed water. After the radiator has drained, the element again is in contact with the steam which closes the trap until sufficient condensate has formed to cool and again open the trap.

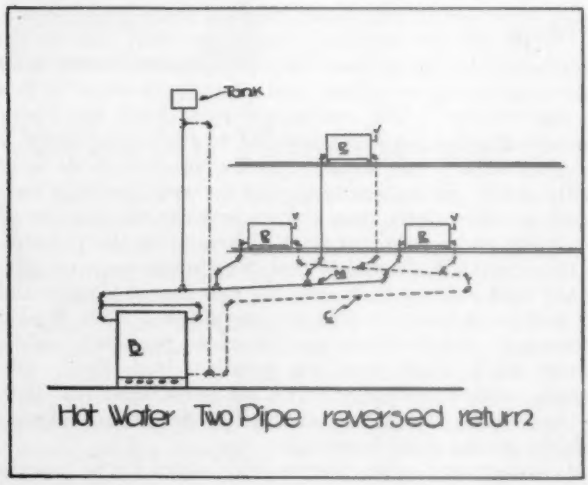


Fig. 3—Flow in Two Pipe Reversed Return System

In addition to the main vent valve, vapor specialties often include a so-called return trap which is designed to return the condensation to the boiler if the steam pressure suddenly rises. As the pressure in a vapor system is determined by the height "head" of the condensate above the water line of the boiler a sudden increase of pressure may flood the return in most cellars, unless the water can be returned to the boiler before the "head" and consequently the pressure becomes too great.

Where a low pressure system is possible with gravity return a proper vapor installation has all the advantages over the one pipe system brought about by reducing resistance to flow and accelerating drainage. These can be summarized in a few brief statements.

1. Quick response to the demand for heat by sweeping out of air instead of venting through relatively fine orifices.
2. Easy circulation because of effective drainage.
3. Quietness since steam is not prematurely condensed by passing through a slug or pocket of water.
4. Individual radiator control.

Vacuum Pumps

In larger systems, the frictional resistance may be so great that natural circulation will not suffice. In these cases a vacuum pump is used between the radiators and the boiler to accelerate the return of condensation permitting steam to flow more quickly and effectively. The boiler, risers and radiators carry steam at low pressure, the returns have air and condensate at sub atmospheric pressures. In a special modification, however, the entire heating plant may be working under a partial vacuum. This differential system aims to produce steam at temperatures commensurate with the demands for heat. On cold days it may generate steam at 2 lbs. pressure (220°F.) but on warm days at 20 inches vacuum (160°F.). The value of the varied steam pressures is the continuous production of heat of the correct temperature to prevent overheating. The mechanical equipment is elaborate and the smallest installation suitable for only an extremely large residence.

Hot Water Heating

When water is heated, it expands, becoming lighter and rises, the cooler water taking its place. A circulation is started as the result of this "heat pump." The tank water heaters, as outlined in a previous chapter, fill a storage tank because of this property of water. If instead of a storage tank a space is provided which will cool the heated water, more ideal conditions are created for the operation of the heat pump and circulation is more rapid. This is exactly what occurs in hot water house heating. The boiler heats the water which rises, being replaced by cool water and initiating circulation. Instead of the hot water being stored it gives up its heat, becoming heavier and speeds the circulation. There must always be a source of pressure greater than the head of the highest radiator.

As in the application of steam, considerations of economy and excellent performance have introduced various methods of distributing the water. The most satisfactory for uniform temperatures is the two pipe reversed return, in which the cooled water from the radiator furthest from the boiler is returned to it first. The complete circulating system to the different radiators is best balanced with this layout. Fig. 3 shows the flow in a two pipe reversed return system.

Economy and competitive bidding produced the one pipe system in which the returns from one radiator are mixed with the hot water to the succeeding radiators. This system is shown in Fig. 4.

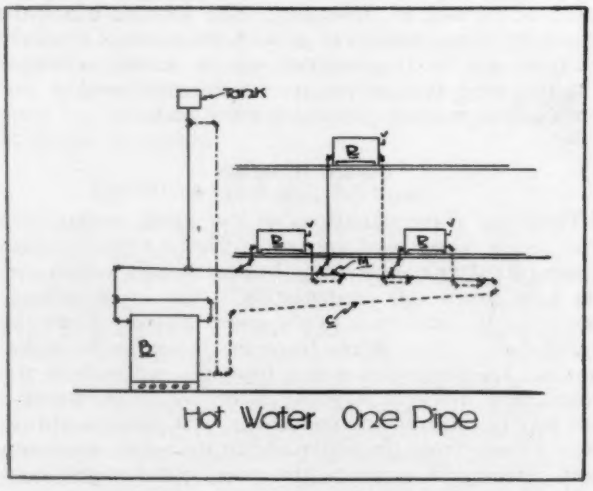


Fig. 4—One Pipe Hot Water System

A perfect hot water installation will permit the inlet water to the radiator of 180°F. to cool to 160°F. before leaving, which gives a mean temperature of 170°F. With the radiator standing in a 70° room, the heat emission per square foot of radiator surface is 150 B.t.u. per hour as compared to a heat emission of 240 B.t.u. from the steam systems at 2 lbs. pressure. Because of this lower heat emission of the radiators using hot water, a greater radiating surface is needed to give the same total heat as any given steam radiator. This may be partly overcome by modifications of the source of pressure which is needed to bring about circulation to the highest radiators. The pressure on the usual hot water system is produced by the head of water in an open tank, located several feet above the highest radiator or radiator

riser. This open tank is often replaced by an air tight pressure tank in conjunction with a suitable reseating pressure relief valve. The radiators and risers are completely filled with water by releasing the air through the individual radiator vent valves. The air tight expansion tank, however, is not relieved so that air is trapped in it. With the expansion of water caused by heating, the air in the tank acts as a cushion to take up the expansion of water by creating a pressure which increases as the water temperature increases and falls off as the temperature drops. A reseating relief valve is so located that if the pressure becomes too great water will be discharged until a safer operating pressure is reached. Make-up water is not needed unless an excessive water temperature is produced.

A closed system without an expansion tank is accomplished by connecting the heating system to the water supply through a strainer, reducing valve and a special two way relief valve. This valve closes the supply when a pressure of 10 lbs. is reached in the system. By expansion the pressure builds up and a pressure of 25 lbs. is maintained because the valve relieves only enough water to hold this point constant. When cooling occurs, the pressure drops until at 10 lbs. the supply valve opens to again make-up the loss. It is more important to regularly release the air from the radiators with this method of producing the increased pressure than with any other hot water system.

The value of the hot water systems lie in the low temperatures carried, the steady circulation of a uniformly heated medium and a constant output of mild tempered heat.

Warm Air Heating

The staunchest advocates of warm air heating will contend, perhaps correctly, that heating from a low temperature radiator is almost entirely by convection of warm air. Therefore, the obvious method of heating is by air heated directly by the fuel. Warm air circulates according to the same principles as hot water, that is, the warm air is lighter and rises, cold air rushing in and displacing the heated air. The warm air from the furnace is directed through ducts and registers to the rooms to be heated. To be entirely satisfactory the cooled air should be returned to the furnace by another set of ducts, thereby completing the circulation. These return ducts are usually omitted and a large grill or cold air box is located on the floor above the furnace to return cold air for heating. In the usual installation this cold air box collects much of the cooled air in the house and also outside air enters as well.

Two types of warm air circulation are possible, that resulting from gravity displacement and that produced by a fan. The gravity system is designed to give a full flow in the ducts, free from frictional resistance with a resulting temperature at the register face of 175°F. This gives a delivery of 110 B.t.u. per sq. in. of basement duct at the 1st floor register, 166 B.t.u. at the 2nd floor and 200 B.t.u. at the 3rd floor registers. The actual sensation of warmth from a warm air system is greater than from either a steam or hot water installation because of the more rapid circulation of warmer air.

A fan type warm air system is not dependent for circulation on differences in weight between the warm and cold air, but actually delivers a stream of air because of fan action. With the added pressure of the fan the ducts can be smaller and less regard paid to pressure drop through the delivery piping. It is most essential that the fan operate only when heat is being produced as the circulation of cold air after the supply of heat has been cut off will entirely wipe out the advantages. For boosting the delivery of one duct or to a certain room, individual duct fans have been more than satisfactory. Synchronizing this with the furnace operation upsets the distribution of the heat to favor the duct with the fan. Applying a fan to the entire furnace in a house with spotty heating merely accentuates the differences, but the duct fan actually corrects improper distribution.

The boiler or furnace is only the source of heat, but unfortunately bears the brunt of the ailments of the entire job, without regard to the trouble. As the source of heat it must have a burner and container in which the fluid is heated. For appearance a removable jacket covers the sections and drain cocks, safety pop valves, pressure gauge, gage glass and try cocks are requirements of the A. S. M. E. Boiler Code. Boilers used on a hot water system and warm air heaters are equipped with accessories pertinent to their particular requirements. Safety is assured by the A.G.A. requirements which call for pilots, draft hood, gas pressure regulator, main control valve and operating limit controls.

The construction of steam and hot water boilers is identical, hence the description of these boilers can be combined.

Burner Construction

The burner heads of the drilled raised port type are of cast iron and separate from the mixer tube. To make certain of a uniform flame height from all ports, some designers graduate the volume of the mixture chamber to agree with the port area. This construction also tends to reduce the noise of extinction. The burner head is provided with a tapered machined socket which fits over a corresponding ball on the mixer tube. Lugs cast on the burner head and tube maintain the proper alinement of all the burner parts. The yoke of the mixer is supported by the gas orifice and plug cock, usually of the angle type. In many cases the mixer face and air shutter are within the boiler chamber, but arranged to obtain perfect air supply. This location subjects the entire burner assembly to the combustion chamber pressure which prevents noise. The combustion chamber surrounding the burners is made either of a separate cast iron base, which carries the sections or by extending the end sections to the floor as water leg heating surface. The bottom of the boiler sections forms the top of the combustion chamber and a sheet metal false bottom provides for distribution of air for combustion.

A burner made of a number of luminous flat flame tips manifolded into a single burner has been introduced within the past year, particularly on warm air furnaces. All air for combustion is supplied after the gas has left the tip. This burner operates best at pressures below 2 inches of water, making it desirable for districts with low main pressures. By locating the burner so that impingement is impossible and giving good air distribution and combustion volume, carbon is not deposited.

The Sections

Gas Boilers are usually sectional boilers in which the sections are connected by push nipples and held in place by tie rods. The heat absorbing surfaces of the sections baffle the products of combustion to extract the greatest possible quantity of heat from them. This can be accomplished by casting projections on the outside of straight sided sections so that those on adjacent sections almost meet. The hot products are deflected in an irregular path producing not only a longer gas travel

but also adding greatly to the total heating surface. Another design has sections with zigzag sides, the gases being kept in close contact with sections by having the zigzags on adjacent sections staggered to produce the scrubbing effect. A section with a number of inclined tubes in which the tubes are alternate in adjacent sections bring about a thorough baffling action. Other methods of producing close contact and long gas travel are fairly common.

The net result is to give the maximum absorption of heat from the flue gases and still give high enough flue gas temperatures to prevent condensation in the chimney. The lowest practical temperature should be 270° which occurs with hot water systems. The Chart, Fig. 5, shows the flue temperature under different boiler operations, for hot water and steam heating.

Warm Air Furnaces

The construction of warm air furnaces is far from being as standard as steam and water boilers. Not only is the design of the heating surfaces widely different but even the materials are subject to great difference of opinion. There are heating surfaces of cast iron, the furnaces being both sectional and integral, and also of sheet metal. Sheet metal surfaces are rectangular, round, diamond shaped, triangular, elliptical or a nest of flat cigarette box sections. The furnaces themselves are similar to the round coal fired furnaces, oblong or sectional.

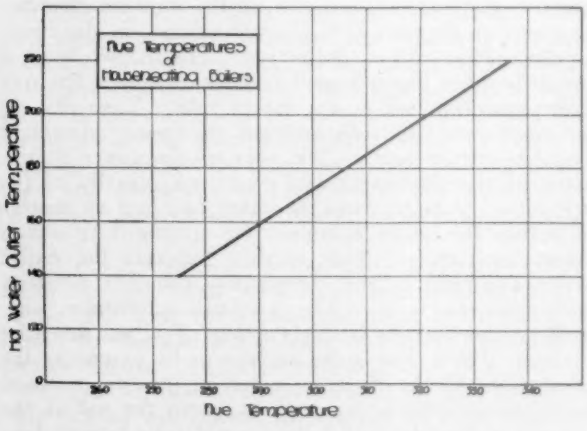


Fig. 5—Flue Temperature for Different Boiler Operations

Each designer claims superiority for his particular model. Between furnaces of proper and first grade construction little difference exists. Sheet metal surfaces have the advantage of rapid heat transfer because of thin walls, which is compensated after the initial heating up by the baffling action and thorough scrubbing of the cast iron sections built along the same lines as boiler sections. The weight and heat capacity of cast iron surfaces hold heat for a longer period and gradually dissipate it to give a tempered increase and decline in room temperature. Corrosion resisting surfaces are desirable but are more costly than plain sheet metal. The sectional cast iron furnace, each with its own burner and thermostatic pilot, permits operating the furnace in units and adding additional sections as lower outdoor temperatures occur and more heat is required. The round cased furnaces are also interchangeable with coal fired furnaces and represent an easy installation. The square furnaces make possible the same attention to beautifying the cellar as the square boilers.

Gravity warm air systems present the simplest possible installation but the pressure type gives more positive air circulation and the further possibility of air conditioning and summer house cooling.

(Continued in July issue)

Gas and Geysers

A REALISTIC reproduction of the Upper Geyser basin of Yellowstone Park, with geysers in action is proposed as one of the features of the gas industry exhibit at the Chicago World's Fair in 1933. This exhibit would be under the auspices of the chemical engineering section of the National Research Council Science Advisory Committee.

The purpose of the Upper Geyser basin display is to show the 100,000,000 visitors who are expected to visit the Chicago exposition that the manufactured gas industry of this country produces daily more potential heat than is required by nature to heat the millions of gallons of boiling water erupted by the twenty principal geysers in Yellowstone Park.

A report to the National Research Council Science Advisory Committee recommends "a 20 by 10 foot exact and natural reproduction, as to scale, color and topography, of a section, one mile by one and a half miles, of the Upper Geyser basin, standing about four feet high and constructed of suitable hot water-proof materials to represent the surface topography as to geysers, river, bridges, land, roads, trees, Old Faithful Hotel and other buildings."

The geyser display is one of a series of 50 individual exhibits with which the chemical engineering section would illustrate all phases of the development of the gas industry, both historically and technically. The gas industry exhibit plan is sponsored by the American Gas Association which is represented on the chemical engineering section by R. B. Harper, chief chemist of the People's Gas, Light and Coke Company of Chicago, and H. J. Rose, assistant director of the Koppers Company of Pittsburgh.

Coefficient of Friction

(Continued from page 38)

sults obtained. It is therefore clear that it is necessary to carry out additional investigations on existing high pressure natural gas distribution systems in order to obtain the desired data.

The commonly used formulae cannot be employed in the entire field of turbulent flow through rough pipes used in practice. The coefficient of friction is introduced into the American pipe line formulae in connection with diameter of the pipe, as was shown in the investigations which were carried out by Johnson and Berwald. This practice can scarcely give results which are satisfactory in general. The power formula with equally great exponents must be used at most for a limited region of Reynolds coefficients.

In order to calculate high pressure lines with rough internal surfaces, the mere possibility seems to exist of obtaining the approximate value of the coefficient of friction from the diagrams and the calculation is then carried out according to the known flow of gas formulae with several approximations

Production Conference Studies Fundamental Problems

EDITORIAL STAFF REPORT

FUNDAMENTAL changes are taking place in the economic and technical structure of the manufactured gas business of America. This fact was made clear and a frank facing of the problems and a most helpful discussion of technical developments took place at the Joint Production and Chemical Conference of American Gas Association at Cleveland, May 21 to 23. The energetic attack made on the technical difficulties and on any remaining inefficiencies of gas making made this three-day gathering probably the finest technical convention ever held by the industry.

About 400 engineers and chemists participated in the six technical sessions of which two were under the auspices of each of the three committees dealing with carbonization, water-gas, and chemical problems. The presiding officers were S. P. Burke, Chairman of the Chemical Committee; I. K. Peck, Chairman of the Water-Gas Committee; and Fred Denig, Chairman of the Carbonization Committee. H. W. Hartman, Assistant Secretary-Manager of the Association, served ably as secretary of the Conference and general manager of affairs, all of which moved with most gratifying smoothness from start to finish. Many of the participants in the Conference took advantage of their presence in Cleveland to visit the Central Laboratory of the A.G.A., where by prearrangement groups of visitors were received by the Director, R. M. Connor, and shown the laboratories, with full explanation of the scope, type, and policy of the work under way.

The making or enriching of gas with oil and the operation of automatic mechanical water-gas generators were unquestionably the outstanding technical subjects considered by the Conference. The first group of papers extended from questions of chemical evaluation through cracking of heavy oils and tars to the economics and practical plant methods for utilizing refinery still gases, propane and butane, and to two new methods for oil-gas making. Perhaps for the first time there were presented in these papers such engineering data as would permit an accurate and complete cost appraisal to be made by any company management interested.

The symposium on automatic grates and chargers of the Water-Gas Committee afforded like constructive and definite aid for engineer as well as non-technical executive. A group of six papers presented experiences under different managements and different local conditions which in the composite permit a fair appraisal as to how the newer types of completely automatic water-gas machines may be adapted to the reduction of gas-making costs. Thus there was afforded to those in attendance that extremely practical service which should justify many times over the expenditure of time and money required for attendance at these meetings. In fact, it was remarked by one participant in the Conference that it was surely a stupid man who could not make money for his company by coming to gatherings as valuable as those held at Cleveland.

Space does not permit review, even in brief abstract form, of many of the excellent papers and committee reports presented. There can be included here only condensed summaries of those few which seem to have the most immediate concern in view of the rapidly changing conditions within the industry. However, thanks to the efficiency of A.G.A. management, any interested company or individual member of the Association can procure from headquarters copies of all of those manuscripts which he requires. There are 33 of these documents, all of which have been mimeographed or pre-printed, both for the use of those in attendance and for distribution to companies which unfortunately were not able to be represented.

Despite this splendid service and the availability of the prepared papers, company executives should realize that a very large part of the benefit of a conference such as this comes from the enthusiasm given and the personal contacts and discussions made possible through active direct participation in the sessions. No distribution of pre-printed papers, nor even the longest resume report which could be prepared, will adequately take the place of personal participation by the representative technical men of every company.

Carburetting Water Gas with "Bunker C" Oil

J. V. RICHARDS
Public Service Elec. & Gas Co., Newark

THROUGH an elaborate series of experiments and comprehensive tests, covering a period of ten years, Philadelphia Gas Works and Public Service Electric and Gas Company have succeeded in substituting "fuel oil" for "gas oil" in the manufacture of carburetted water gas at all their plants. The substitution has proven highly successful from an operating viewpoint and has enabled these producers of gas to circumvent the problem of the gradually increasing price of "gas oil" which recently threatened to become almost prohibitive.

These tests and similar operations during 1929 in Philadelphia, Trenton, and other New Jersey cities have produced striking results, demonstrating the low carburetting oil costs attainable in this manner. One set of results for thirty days' operation were:

Make per set day	3,234 M
Make per running hour	157,900
Make per run	17,540
Fuel per M	16.97 lbs.
Oil per M	4.30 gal.
B. T. U.	534

These tests led to the conclusions that economical operation is best obtained at Trenton by omitting the blow-run and putting all the carburetter oil in on the up-run and splitting the generator oil in a ratio of 40% on the up-run to 60%

on the back-run. Slight variations can be made to control the gravity. Results would indicate that large capacities can be had by the use of this reforming method.

Four samples of oil of varying characteristics and prices were supplied to determine the one best adapted for future use. The samples submitted were Bunker C-30% Cracking Still Residuum, Bunker C-0% Cracking Still Residuum, Bunker B-30% Cracking Still Residuum, and Bunker B-0% Cracking Still Residuum. Taking into account the price factor, the most economical oil may readily be computed from the following test results:

	Make Per Run	Oil Per M	Gen. Fuel Per M	Gravity
Method No. 1: Add. of maximum oil to carburetter on up-run with enough oil to generator on up-run to maintain required B. T. U.'s	12.5	3.36	25.5	.65
Method No. 2: Add. of maximum oil to carburetter on up-run with enough oil to generator on up-run to give required B. T. U.'s in using blow-run	15.1	3.48	21.2	.71
Method No. 3: Add. of oil to carburetter on up-run with oil in generator split in ratio 40% and 60% on up-run and back-run respectively (Reforming)	16.5	4.13	18.2	.62
Method No. 4: Combination of methods No. 2 and No. 3	17.86	4.19	15.1	.67

	Bunker "C" 30% Cracking Still Residuum	Bunker "C" 0% Cracking Still Residuum	Bunker "B" 30% Cracking Still Residuum	Bunker "B" 0% Cracking Still Residuum
Gas Made	16,212 M	16,794 M	10,169 M	10,328 M
Oil Used (Gal.)	63,064	62,883	39,256	39,188
Oil per M (Gal.)	3.89	3.74	3.86	3.79
Fuel Used (Lbs.)	293,412	309,248	193,856	204,378
Fuel per M (Lbs.)	17.30	17.50	18.17	18.80
Make per Run	16,080	16,430	16,470	16,220
Make per Set Hour	157,150	153,400	150,000	147,000
Specific Gravity	.615	.598	.607	.610
Air Temperature	42°	36°	23°	24°
B. T. U.	531.5	530	520	534

From the foregoing data and information it is evident that great flexibility exists in the use of Bunker C types of oil. The method of operation may be divided into four classes:

1. Use of maximum oil in the carburetter on the up-run with just enough oil to the generator on the up-run to maintain required Btu's.

2. Use of Maximum oil in the carburetter on the up-run with enough oil to the generator on the up-run to give required Btu's when using blow-run.

3. Use of oil in carburetter on the up-run with oil in the generator split in the ratio of 40% and 60% on the up-run and back-run respectively. (Reforming.)

4. A combination of method two and three.

The method of operation to be selected for a plant depends upon the price of generator fuel and the price of oil in each particular plant.

For the most economical results the following general deductions are made:

1. When the price of generator fuel is the prime factor in the cost of gas, use blow-run or reforming or a combination of both methods. (Methods 2, 3, and 4.)

2. When the price of oil is the prime factor in the cost of gas, use no blow-run or reforming. (Method 1.)

3. Method 1 gives lowest capacity, method 4 gives the highest capacity with equal gravities.

Variations of this procedure can be made as the individual plant conditions dictate.

To better illustrate this, four concrete examples of actual operation are tabulated:

The method to be adopted is further governed by the gravity required for any given territory. The gravities for corresponding methods of operation are also shown in the table.

As a conclusion to the foregoing tests using Bunker types of fuel oil it has been shown that:

1. Fuel oil with high viscosity can be handled.

2. Severe changes in oil characteristics can be compensated for by changes in the operation.

3. Capacity can be varied.

4. Gravity can be controlled within certain limits.

5. Residuals can be handled without serious difficulty.

6. Excessive separator emulsions can be prevented.

7. Compared with gas oil, large economies are obtainable.

The Harrison plant of Public Service Electric and Gas Company was converted entirely to the use of fuel oil some months ago. The daily average output ranges from thirty to thirty-five million cu. ft. The blow-run reforming method of operation is used. An average of their operating results to date are herewith given:

Make per set day	4,914 M
Make per set hour	204.9
Make per run	19,800
Make per sq. ft. grate per day	75,800
Make per sq. ft. grate per hour	3,220
Generator Fuel per M	18.3
Oil per M	3.93
Specific Gravity	.66
B. T. U.	535
H_2S	209
CO_2	4.6
Average cleaning time	106 min.

Since putting fuel oil in operation at all the plants of the Public Service Electric and Gas Company of New Jersey, namely, Trenton, Paterson, Harrison, Jersey City, and Camden, all gas supplied by these stations has been made by this process and to date no distribution troubles have been encountered.

The operating results for the Philadelphia Gas Works using fuel oil are as follows:

Daily average make	23,000 M
Generator Fuel per M	22.56
Oil per M	3.56
B. T. U.	531
Specific Gravity	.689
H_2S	125 gr.
Naphthalene	2 to 4 gr.

All the gas produced by the Philadelphia Gas Works is carburetted with fuel oil.

Read the Full Papers!

Complete copies of substantially all papers presented at the Production Conference can be had by member companies and individual members on request from American Gas Association headquarters, Graybar Building, New York City. Readers of the Journal are urged to secure such material for those subjects in which they are particularly interested. No abstract or reprint will do these splendid manuscripts full justice. —Editor.

Actifier Air Disposal in Boilers and Gas Producers

M. T. HERREID
Asst. Supt., Connecticut Coke Co., New Haven

IN the Seaboard Process, two operations are carried out. The hydrogen sulphide and hydrocyanic acid are removed from the gas in a Scrubber called the Absorber, by the use of a dilute solution of soda ash. The resulting foul soda solution is then treated by a large volume of air in a second tower called

an Actifier. The aeration regenerates the solution so that it may be used over again in the absorber. The air leaving the actifier contains most of the hydrogen sulphide in a very dilute form. This actifier air is used in both the gas producers and boilers at New Haven in place of the regular air supply, in this way avoiding any possible odor problem due to discharge of H_2S into the atmosphere.

The air is sucked througn the actifier tower both by the producer blowers and the boiler blowers. General Electric turbo blowers discharge part of the actifier air to the producer grates and Sturtevant blowers deliver the rest of the actifier air to the boilers. The producers require about 800,000 cubic feet of air per hour, while the boilers use from 1,000,000 to 2,000,000 cubic feet of air per hour, depending on the seasonal load. As the volume of actifier air amounts to about 1,400,000 cubic feet per hour, the total requirement of producers and boilers is more than sufficient to take care of all the actifier air available.

The New Haven Liquid Purification plant has operated with excellent results over the year and half period. The method in use for handling the actifier air has been eminently satisfactory and has demonstrated the practicability of using the Seaboard Process in gas plants located in large cities and close to residential districts.

Reforming Petroleum Still Gas

R. G. RINCLIFFE

Supt. of Gas Production Philadelphia Electric Co., Chester, Pa.

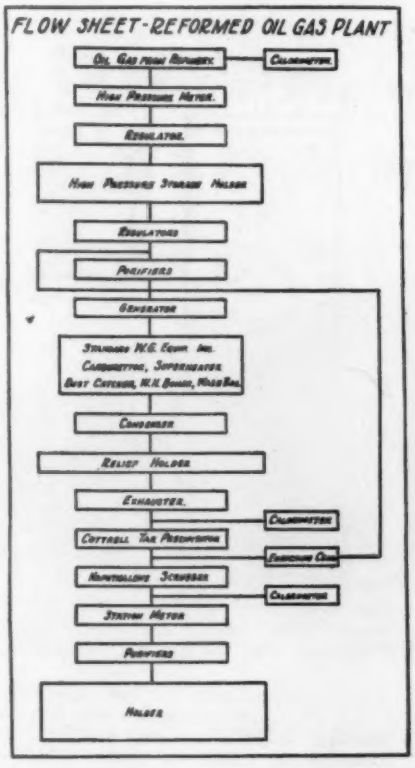
THE reason for development of this process by the U.G.I. was twofold:

(1) To utilize refinery oil gas, a product which is abundant in the metropolitan Philadephia area at a mutual profit to both oil and gas industries.

(2) To provide a means of producing a variable gravity reformed gas in order to supply a constant gravity in a territory where Coke Oven Gas supplies the base load.

The calorific values of the refinery gases depend upon Still operation and the crude stock used, varying from 1300 B.T.U. to 1800 B.T.U. per cu. ft., and the specific gravity will vary between the limits of .95 and 1.1. The wet refinery gases are cooled after leaving the stills, and are compressed to 175 No. /sq. in. to remove as much of the condensible gasoline vapors as possible, so that the gas as delivered to the Reforming Plant is relatively dry, being free from saturated oil vapors and moisture and is available for delivery under high pressure without further compression.

The oil gas after purification is ready for reforming. The apparatus consists of standard water gas equipment, equipped to use oil gas. The set at Chester is a 9'0" internal diameter U.G.I. self-clinkering generator, with carburetter, superheater, and wash box, and equipped with Chrisman cycle and waste heat boiler. The number of cams on the automatic control machine has been increased to eight to take care of the additional hydraulic valves for oil gas control.



The cycle used differs quite appreciably from the carburetted water gas cycle, since it is not necessary to maintain high carburetter temperatures: however, there must be sufficient temperature in the fuel bed to give the desired degree of cracking or breaking down of the refinery gas into the lower gravity, lower heating value hydrocarbons. The cycle itself and the rates of flow will depend upon the character of broken down gas desired.

In case of a refinery gas failure, the operation may be changed to carburetted water gas on one hour's notice, it being only necessary to bring up the carburetter heats to the proper point for gas oil cracking. Carburetter and superheater inspections after 2100 running hours showed practically no deposit of any kind owing to the efficiency of the cyclone dust arrester, located between generator and carburetter.

Coke has been used exclusively as generator fuel, and the consumption has varied from 6.98 to 17.01 No M.C.F. finished gas, with different types of operation. Of the various sized cokes used, it has been found that the furnace size, ranging from 3" x 2" to 2½" x 1½" has given most satisfactory results. Generator fuel using furnace coke will be slightly higher than when lump size is used, but the set capacity will be increased about 12%, and the oil gas required will be reduced. The cubic feet of refinery gas required /M.C.F. of enriched reformed gas has varied from 241 to 368 cu. ft. The most satisfactory operating conditions from the standpoint of economy and production have been with generator fuel at 11.97 No. /M.C.F. and oil gas at 259 cu. ft /M.C.F. when the calorific value of the oil gas was 1575 B.T.U./cu. ft.

The reformed gas after it leaves the set passes through a high duty tubular condenser, where the temperature is reduced from 130°F. to about 90°F. From this point the gas passes to a 250,000 cu. ft. relief holder, and from there to the exhausters. The exhausters pump through a Cottrell tar precipitator where the last traces of tar are removed, thence to the naphthalene scrubber and the station meter. The tar production is approximately .06 gallons /M.C.F., which has a minimum value of about 2½c per gal. when used for boiler fuel. From the meter, the gas passes through the purifiers to the storage holders.

The reformed gas in the relief holder will have an average calorific value of about 437 B.T.U. /cu. ft. depending on the cycle used and is brought up to the Pennsylvania Standard of 520, by enriching with refinery gas. This enriching gas is injected into the reformed gas main before the Cottrell inlet by means of a Cutler-Hammer automatic control working in conjunction with a motor operated Dean valve.

In general the operation of the Chester Plant has been found to be very flexible, both from the standpoint of daily make and gravity: maintenance has been low and production cost to date has been below that estimated. The organization of six men per shift is capable of producing 11,600 M. cu. ft. of enriched reformed gas daily or reforming three million cu. ft. of refinery gas, and the production on the 9 ft. mechanical generator has been built up to a daily make of 6,500 M. cu. ft. Work has been started on the installation of an additional unit duplicating those already in use which will also utilize refinery gas to take care of the anticipated increase in load for the winter of 1930 and the year of 1931.

Chemical Evaluation of Gas Oil

J. EDWARD BREWER

Chemical Service Laboratories, Philadelphia

SEVERAL years of chemical laboratory testing of gas oils has been done by the method of Mighill and the results have been compared with the actual plant results from using these oils furnished by one of the clients for whom the work has been done.

The data covers 29 barges of oil during a period of 18 months representing about 5,000,000 gallons of oil. In order to better show trends we have divided the 29 samples into three groups based on the percent available for gas enrich-

ment *as calculated from the laboratory analysis.*

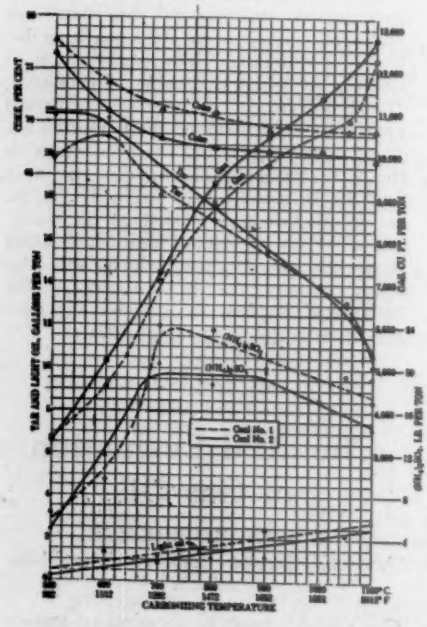
	Group A	Group B	Group C
No. of barges	9	11	9
% Available for Gas Enrichment	67-70	70-73	73-76
Average % Available for Gas Enrichment	68	71.8	75.6
Plant results, Average oil per M	2.99	2.92	2.80

These and numerous other results clearly show that in a large majority of cases the Mighill methods of evaluating enricher value of gas oils are an excellent indication of the plant performance to be expected when these oils are used in water-gas making.

Tests of Coking Coals

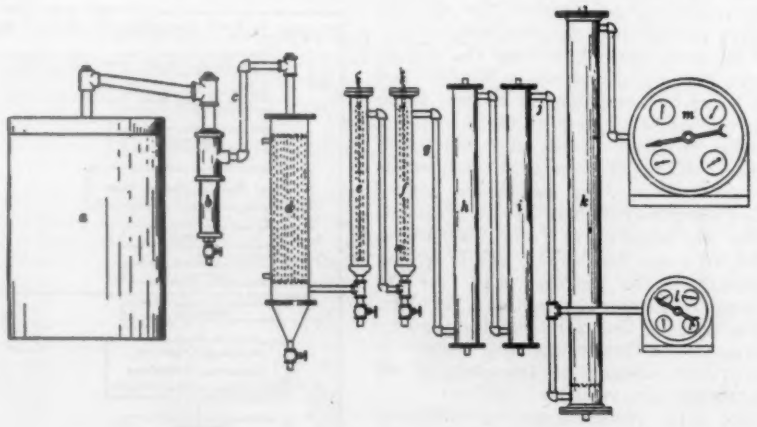
AJ. D. DAVIS and A. C. FIELDNER.
U. S. Bureau of Mines

PRELIMINARY results from the "Survey of Gas and Coke-Making Properties of American Coals" demonstrate an important and close relationship between the test data with the 80-pound experimental retort and the practical industrial-plant results obtainable in coke ovens and retorts. The important influence of carbonizing temperature on yields is shown by the accompanying chart.



Other charts (not reproduced) show the relation of carbonizing temperature to the chemical composition and physical properties of the cokes. Still other charts show the relationship between tar and gas composition and properties and the temperature at which these products were produced.

There are no low- or medium-temperature carbonization industrial data available for the two coals tested with which to compare the corresponding test data given herein. All one can say in this regard is that they are of the general order one would expect from analysis of laboratory and semi-industrial scale data reported in the literature for a similar coal.



Complete high-temperature industrial scale test data are available for Coal 1. They cover three distinct types of gas- and coke-making equipment; the average of results from the three different types (coke oven, horizontal and vertical retort plants) are shown together with average experimental results for temperatures 1050° and 1100°, as follows:

Yields	Coke, per cent	Tar, gallon/ton	Gas, cubic feet/ton
Average of plant tests	69.8	11.8	11,525
Test results at 1050° carbonizing temperature	69.3	13.2	10,822
Test results at 1100° carbonizing temperature	69.4	10.1	12,237

The experimental equipment is arranged as indicated in the diagram. The several parts of the coking and gas-handling apparatus are as follows: A, Furnace and retort; B, Air-cooled tar trap; C, Water-cooled condenser; E-F, Cottrell precipitators; H, Ammonia scrubber; I, Hydrogen sulphide absorber; K, Light oil scrubber; L, Sampling meter; and M, "Station" meter.

Results for only two coals, however complete they may be, do not furnish an adequate basis from which to draw general conclusions as to the applicability of the test method. Attention, however, is called to the following points.

1. Provided that the temperature of test carbonzation was properly chosen, test results did agree closely with average industrial practice in the case of the Warden coal; and this is one coal at least on which we have reliable and complete industrial scale data.

2. Low- and medium-temperature coked for these two coals are consistently more resistant to breakage than those made at the highest temperatures, as judged by results of the A.S.T.M. Standard shatter and tumbler tests. This seems to be due to excessive shrinkage caused by large losses of volatile matter from the coke on being subjected to high temperatures.

3. The agglutinating power as a measure of coke strength applies only if at all when the carbonizing temperature at which it is determined is near that of the coke in question.

4. Per cent cell space in coke for these two coals does not change appreciably with carbonizing temperature.

More Reports Later

American Gas Journal regrets that the wealth of splendid material presented at Cleveland makes full report in this issue impossible. In later issues we promise our readers adequate reports of oil-gas making, mechanical water-gas generators, gas conditioning, and other subjects which are forced to wait. If those topics are of urgent importance to our readers we suggest that they get the full papers from A.G.A. headquarters, where mimeographed copies are available for the asking.—Editor.

Cost of Reforming of Refinery Still Gases

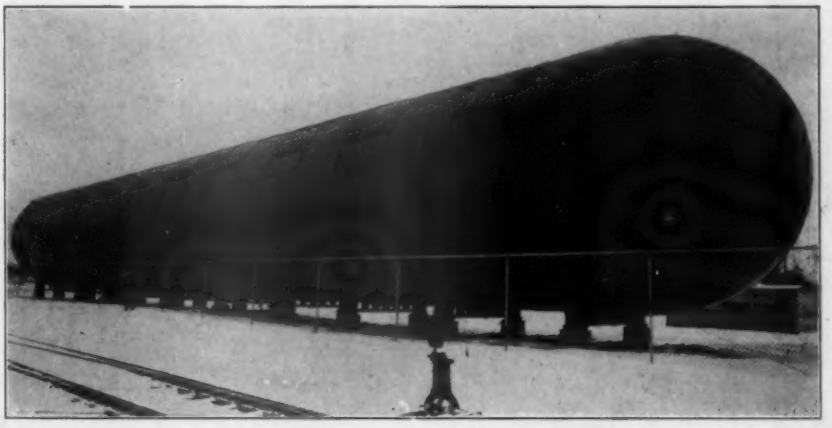
C. A. SCHLEGEL
United Engineers and Constructors, Philadelphia

THE successful operation of the Chester oil-gas-reforming plant where the U.G.I. Reforming Process is used has demonstrated that the utilization of refinery gases is commercially feasible and economical. Three general conditions of using refinery gas should be considered: Refinery gas for cold enrichment, reformed refinery gas used with carburetted water gas, and reformed gas used with coal gas.

(Continued on page 67)

This "Stacey Bullet"

is One of the Largest High Pressure Gas Holders East of the Rocky Mountains



It is 185 ft. long—25 ft. diameter, has a capacity of 354,000 cu. ft. at 60 lbs. pressure. It is used as a stabilizer and reserve on the high pressure line from Racine, Wisconsin, to seven of the prominent outlying towns. This system is 125 miles long.

The Wisconsin Gas & Electric Co., for whom this "Stacey Bullet" was built, while having a pressure holder which will remain gas tight under high pressures, has the further advantage of being able to add as many more sections as they may desire, without difficulty.

For economy and convenience you should learn more about "Stacey Bullets."

The STACEY BROTHERS Gas Construction Co.

CINCINNATI - OHIO

NEW YORK OFFICE—420 Lexington Avenue—Graybar Building

No Matches!

A Turn of the Valve Lights the Oven or Any of the Burners

Just One of the Many SALES-BUILDING Features of

The A-B 'Aristocrat' Gas Range

1100 SERIES

Fully Insulated Oven
Cooler Kitchens Lower Gas Bills

The AutomatiCook
Oven Heat Regulator

A-B Dual Burner Cooking Top
Saves Gas

The Sani-Tray
(Pat. Applied for)
To keep the oven bottom clean

Don't underestimate the tremendous sales value of the 'Insta-Flame' (patented) which gives to the No. 1100 Series the last word in gas range convenience. No matches—no push button—no trouble or worry: to operate, simply turn the valve.

Outstanding Among All Fine Ranges!

WRITE OR WIRE FOR FULL DETAILS

If you have not received your copy of our 1930 Merchandising Manual write for it today.

A-B STOVE COMPANY, Battle Creek, Mich.

Yes . . . . the price is Lower . . But . . Quality Remains the Same

The straight $50 cut in Kompak Automatic Copper Water Heaters quite naturally has caused a big stir . . . for the whole gas industry knows that Kompak never has and never will sacrifice quality to mere price expediency.

Not a single Kompak part has been cheapened . . . no Kompak feature has been omitted. The new price simply is the result of greatly increased demand for the best possible automatic hot water service and a life-time lasting water heater.

To meet this demand the gas industry has turned to Kompak for the following reasons:

- Kompak Company is the only maker producing copper storage water heaters exclusively.
- Kompak Company makes its own copper boilers.
- Kompak is the only heater with a pilot that shuts off ALL the gas to the heater.
- Kompak is the only heater with a fusible plug that shuts off the gas.
- Kompak is the only heater with a conical coil . . . the gas flame does not impinge against it, hence coil life is extremely long.

These exclusive Kompak features, the superlative type of automatic service Kompak gives plus the new low price make it the easiest selling automatic water heater in the country today. For details write to

KOMPAK

$50 Reduction

No. 20 NOW $130

No. 32 NOW $160

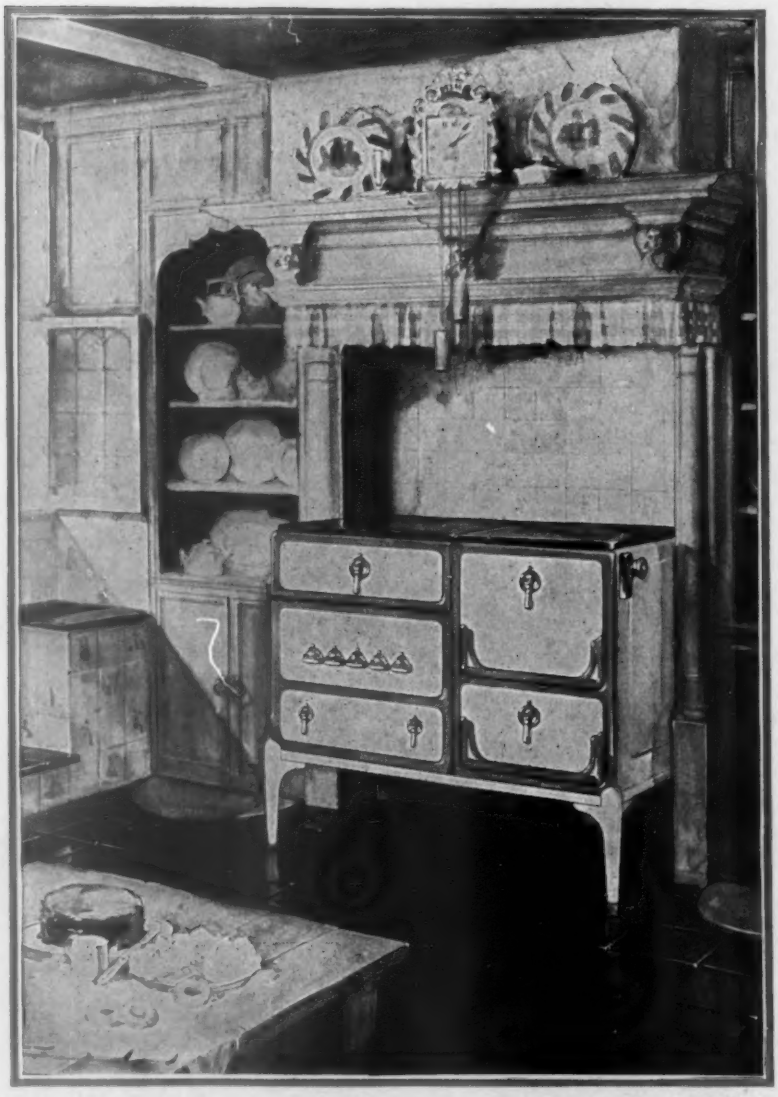
ALL OTHER SIZES REDUCED

The KOMPAK Co.

NEW BRUNSWICK, NEW JERSEY

MAGIC CHEF *the* NEW STANDARD

UNLESS the gas range has a RED WHEEL it is not a LORAIN



Patents Pending

Showing Magic Chef "Jonquil" Model in an Adaptation of an Original Dutch Kitchen—Brought from Holland and Rebuilt as an Exhibit in one of America's Great Art Museums.

MAGIC CHEF, the New Vogue in Gas Ranges, is not a novelty. It represents a new and higher standard in gas range construction. A standard as indicative of the "trend" as was represented by the first closed-type motor car, the first iceless refrigerator, the first console-type radio.

Proof that the public has accepted Magic Chef as the new standard lies in the fact that thousands upon thousands of these supremely beautiful, ultra-modern, incomparably efficient gas ranges have already been purchased.

In fact, more Magic Chef Gas Ranges have been sold to date than were ever sold of any other single new model at the same price or higher, in the same length of time.

Because Magic Chef points the way to increased profits, it should be shown FIRST to every prospect. For, the mere exhibition of Magic Chef creates a desire to own a better, more beautiful, more modern gas range.

And, even when the prospect cannot purchase Magic Chef because of its size or because income does not permit, having first seen Magic Chef, the customer will invariably buy a better, higher-priced gas range than she originally intended to purchase.

Magic Chef

The World's Most Beautiful Gas Range

CASH-PRICE
$195.00

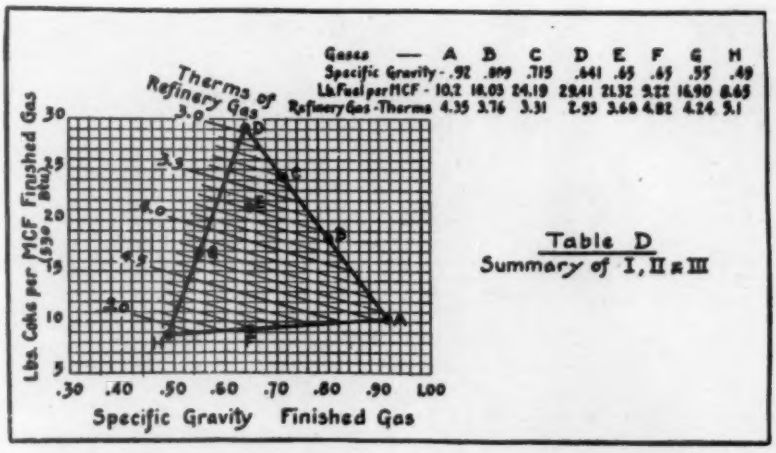
($210 West of the Rockies)
Send name and address for free copy of booklet showing modern kitchens.

AMERICAN STOVE COMPANY • • **DEPT. B, 801 CHOUTEAU AVENUE, ST. LOUIS, MO.**
Largest Makers of Gas Ranges in the World

Reforming Refinery Still Gases

(Continued from Page 62)

In the large tabulation are the approximate operating efficiencies and the estimated cost of production of 530 B.t.u. gas made under these several conditions. The costs presented do not include investment charges since these would vary considerably depending on the length of pipe line from refinery to gas plant, the extent of purification required, whether a new investment for reforming plant is necessary, and with many other common variations of local conditions. Hence, for comparison of these costs with the total costs of other types of gas it is necessary to add appropriate investment charges to the total of material and conversion costs here given.


Gases — A B C D E F G H
Specific Gravity - .92 .809 .715 .641 .65 .65 .55 .49
Lb. Fuel per MCF - 10.2 18.03 24.19 29.41 21.32 9.22 16.90 8.65
Refinery Gas - Therms 4.35 3.76 3.31 2.93 3.68 4.82 4.24 5.1
Therms of Refinery Gas
3.0
3.5
4.0
4.5
5.0
Lbs. Coke per MCF Finished Gas
30
25
20
15
10
5
.30 .40 .50 .60 .70 .80 .90 1.00
Specific Gravity Finished Gas
Table D
Summary of I, II & III

GAS	A	B	C	D	E	F	G	H
	Producer Gas	Producer and Blue Gas		Blue Gas	Enriched Reformed Gas with Blow Run		Enriched Reform Gas No Blow Run	
Kind of Base Gas:								
B.t.u. per Cu. Ft.	130	200	250	290				
Specific Gravity	.89	.75	.64	.56				
Fuel per MCF	14.0	23.6	30.5	36.0				
Finished Gas:								
B.t.u. per Cu. Ft.	530	530	530	530	530	530	530	530
Specific Gravity	.92	.809	.715	.641	.65	.65	0.55	0.49
Base Gas %	72.8	76.4	79.3	81.7	—	—	—	—
Refinery Gas %	27.2	23.6	20.7	18.3	21.32	9.22	—	—
Fuel per MCF—Lb.	10.2	18.03	24.19	29.41	230	301	16.90	8.65
Refinery Gas per MCF—C.F.	272	236	207	183	3.68	4.82	265	319
Refinery Gas per MCF—Therms	4.35	3.76	3.31	2.93	—	—	4.24	5.1
Ratio Refinery Gas to Finished Gas	1:3.7	1:4.2	1:4.8	1:5.5	1:4.3	1:3.3	1:3.8	1:3.1
Cost of Materials:								
Refinery Gas $.015 per Therm and Coke 5.00 per ton	.091	.102	.110	.122	.109	.095	.106	.098
6.00 per ton	.096	.111	.122	.137	.119	.100	.114	.103
7.00 per ton	.101	.120	.134	.152	.130	.105	.123	.107
8.00 per ton	.106	.129	.147	.166	.141	.110	.131	.111
Refinery Gas $ .02 per Therm and Coke 5.00 per ton	.113	.121	.127	.132	.127	.119	.127	.124
6.00 per ton	.118	.130	.139	.147	.138	.124	.136	.128
7.00 per ton	.123	.139	.151	.162	.148	.129	.144	.132
8.00 per ton	.128	.148	.163	.176	.159	.133	.152	.137
Refinery Gas $ .03 per Therm and Coke 5.00 per ton	.156	.158	.160	.161	.164	.168	.170	.175
6.00 per ton	.161	.167	.172	.176	.174	.172	.178	.179
7.00 per ton	.166	.176	.184	.191	.185	.177	.186	.183
8.00 per ton	.171	.185	.196	.205	.196	.181	.195	.188

In the table, gases A, B, C, and D are made with a water-gas set by enriching either blue gas or producer gas with cold refinery gas. Gases E and F are reformed refinery gas enriched to the requisite heating value with uncracked refinery gas. Gases G and H are reformed refinery gas made without blow run to be of low specific gravity suitable for mixing with coal gas or coke-oven gas.

The following conclusions can be drawn from the table: With cold enrichment the gravity limits are from 0.92 to 0.64, the gravity of the finished gas varying with the amount of refinery gas used in the enrichment as well as with the gravity of the base gas. Gases from C to F, inclusive, indicate the flexibility of operation possible, especially demonstrating how the relative changes in solid fuel and enricher, as well as method of enrichment, must be varied to secure the minimum total cost under varying local cost conditions. It is important also to take into account load factor, since refinery gas is unusually most advantageously employed when consumed at a constant daily rate with an arrangement for taking care of peaks by gas-oil enrichment of conventional carburetted water gas.

The chart offers a convenient graphical method for estimating the relative amount of solid fuel and refinery oil gas required for making various specific gravities of finished gas, both with cold enrichment and with reforming. The area of the triangle covers the range of possibilities in utilization of refinery gas with blue gas or producer gas base, either by cold enriching or with reformng. It demonstrates that the reforming process makes possible employment of petroleum-refinery still-gases under almost any conditions of gas-plant operation.

Coke as a Domestic Heating Fuel

P. NICHOLLS
U. S. Bureau of Mines, Pittsburgh, Pa.

THE Subcommittee on Coke is limiting its report on the domestic uses of coke to directing the attention of the members interested in the qualities of domestic coke and in its distribution to an investigation being conducted by the United States Bureau of Mines. A summary of the work was presented in a paper at the Fuels Meeting of the American Society of Mechanical Engineers held at Philadelphia in September 1929; this paper, entitled "Coke as a Domestic Heating Fuel," by P. Nicholls and B. A. Landry, has also been issued by the U. S. Bureau of Mines, Report of Investigations

Coke sold for domestic use in the United States, millions of tons

	1924	1925	1926	1927	1928
Beehive coke	0.14	0.39	0.39	0.11	0.08
By-product coke	2.81	4.09	5.06	4.70	6.25
Gas-house coke	About 1.3 million tons per year				
Petroleum coke	0.235 million tons estimated for 1928.				
Pitch coke	No data available.				

No. 2980, and copies may be obtained on request by addressing the U. S. Bureau of Mines, Washington, D. C.

The first part of the paper is a general discussion on the use of coke as a domestic fuel, summarizing its acknowledged good qualities and analyzing the justification for or the causes of complaints sometimes made by householders.

The remainder of the paper summarizes some of the results of an investigation made to determine the burning characteristics of coke in domestic furnaces which is being conducted by the Bureau at its Pittsburgh Experiment Station. The objects of this investigation have been to make available more definite data on the effects of the size of the coke as fired and of the rate of burning, also to show the relative burning characteristics of cokes of different types, such as heavy and light high-temperature cokes, also low-temperature and petroleum cokes.

The methods of test used differ from those employed in the past in that they aim to separate the effects of the influence of the type and size of the fuel from the other factors which, combined with the fuel, fix the actual results obtained. These other factors of domestic furnaces are (1) the adjustments of the dampers as affecting the quantity of air admitted over the fuel bed; (2) the tightness of the furnace as affecting the control of the rate of burning; (3) the volume of the combustion space and the admixture of the gases from the fuel bed and the secondary air, as affecting the final efficiency of combustion; (4) the capacity of the chimney in its effect on the draft available; (5) the design of the heater in its ability to absorb the heat from the hot gases; and (6) last, but not least, the individuality of the householder in the type of attention he gives to his furnace.

Economic Interrelation-Ship of Petroleum and Gas Industries

H. JANNEY NICHOLS, JR.
Standard Oil Company of New Jersey, Elizabeth

THE petroleum industry is one that markets its product principally in bulk. Where its products are retailed, it is done on the "cash and carry" plan. The gas industry is essentially a retail business in which the gas companies distribute their product to the individual consumer, read meters, submit bills, and collect them. It would therefore seem logical for the petroleum industry to continue to produce and ship propane and butane in bulk and for the gas industry to retail these "liquid gases" to the ultimate consumer. You have the organization for retailing this business—the petroleum industry has not. If these products be put to the purpose for which they are peculiarly adapted, there is a profit for both industries.

It is appreciated that this will be somewhat of a departure from the past and present practice of the gas industry, and in undertaking such a new field, it is natural that the gas industry should question the volume of propane and butanes that may be available and the continuity of supply of these products. The tremendous increase in cracking capacity in the petroleum industry has been briefly reviewed and every cracking unit in the country is a potential source of these products. The cracking units which are now in operation in this country are a potential source of 900,000,000 gallons of propane per year. The heating value of this quantity of propane is equivalent to eighty-five trillion B.t.u., or about 30% of the manufactured gas industry of today. The volume of available butane is equal to that of propane or even greater. Since the gasoline from cracking today is seven times what it was ten years ago, the potential source of propane and butanes from cracking alone in another ten years may be four to five times the heating value of the total manufactured gas industry of today. In addition, Mr. Oberfell, of the Phillips Petroleum Company, estimates that there are 13,000,000 gallons of propane and butanes per day available from the natural gasoline industry. This is equivalent to four hundred and thirty trillion B.t.u. per year, or about one and one-half times the total manufactured gas industry.

In conclusion, it seems obvious that the gas industry may double, treble or even quadruple the volume of its business without adding excessively to new investments in the way of plant equipment, may deliver to industry a satisfactory fuel at a price which the gas industry cannot afford today by present methods and do this at a profit to both the gas and the petroleum industries.

Recent Developments in Coal Testing

G. St. J. PERROTT
U. S. Bureau of Mines, Pittsburgh, Pa.

AS a result of the programs in progress it may be possible within the course of the next few years to present to the user of coal a selected set of the newer testing methods, with standardized procedure, and an interpretation of their meaning in terms of the industrial uses of coal. At present, standardized methods are available for measuring the following important properties of bituminous coal:

1. Proximate and ultimate analysis.
2. Calorific value.
3. Forms of sulphur—that is, pyritic, sulphate, and organic.
4. Size analysis.
5. Gravity separation.
6. Fusion temperature of ash.

Other important factors for which standardized methods are not available but which appear worthy of further work are:

1. Analysis into groups of typical compounds by action of solvents, alkali, etc.
2. Measurement of physical properties such as (a) friability; (b) slacking characteristics; and (c) spalling characteristics.
3. Measurement of certain factors in the coking process such as (a) agglutinating power; (b) plastic range; (c) rate of gas evolution.
4. Development of a reliable assay method for carbonizing properties.

Coking Washed Coal

A. C. FIELDNER
Chief Engineer, U. S. Bureau of Mines

IN considering the use of washed coal, the gas or coke plant operator is concerned with two classes of effects—namely, those due to the removal of free mineral constituents such as slate, shale, bone, and pyrite and those due to the surface moisture left in the coal from the washery. All of the first class are desirable, as they improve the quality of the carbonization products. The second class of effects, those due to moisture, are complex, partly desirable, but mostly undesirable, especially with a material increase of moisture in the coal.

The favorable effects of eliminating free mineral, impurities may be summarized as follows:

1. Improvement of coke quality.

a. Reduction of ash and sulphur.
b. Less clinker trouble.
c. Fewer cross fractures in coke, resulting in greater resistance to breakage on handling, less small coke and breeze.
d. Greater uniformity in chemical composition and physical properties of coke.

2. Less sulphur in gas.
3. Greater yield of gas and by-products per ton of dry coal charged

The adverse effects of moisture are:

1. Reduction of oven capacity and throughput, due to lower charging density of moist coal, and longer time required to complete coking at a given temperature.
2. Higher fuel consumption per ton of coal carbonized.
3. Nonuniform coke, due to wet spots in charge.
4. Excessive moisture, 12 to 15 per cent, causes large-celled, weak coke.
5. Dripping wet coal may cause spalling of the brick oven lining.

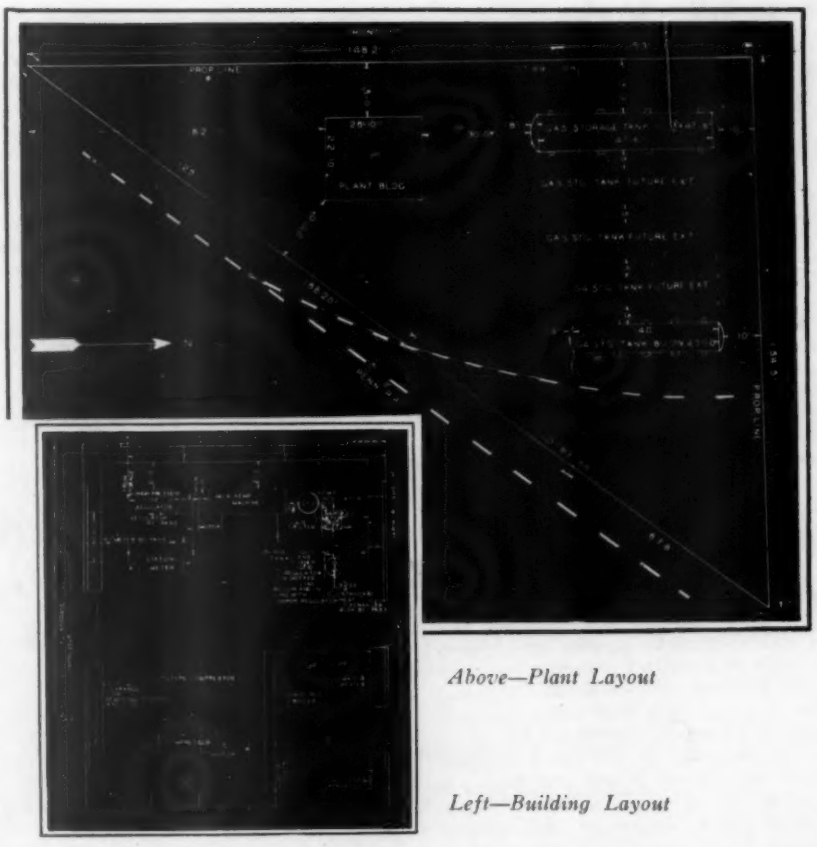
On the credit side of the ledger, moisture increases the ammonia yield, and reduces carbon deposits on the oven walls. Its effect on gas, light oil, and tar is open to question. Other variables, such as temperature, coking time, and amount of moisture complicate the situation, and in the absence of further data, no definite conclusions can be made with respect to these products. On the whole, it seems certain that the moisture should be kept low (not to exceed 4 to 5 per cent) for the most economical results.

Plant for Mixing and Distributing Butane-Air Gas at North Manchester, Indiana

L. C. HEAVNER
Utilities Service, Inc., Fort Wayne, Ind.

THIS plant and distribution system were installed to supply the 3500 inhabitants of North Manchester with 550 B.T.U. gas composed of about 17 percent Butane mixed with 63 per cent air. The plant which has a capacity of 120 M per day cost, including ground, $19,252.78, while the distribution system cost $52,-005.37. On a basis of 500 ultimate customers this figures $104.00 per customer.

Due to the time of the year in which the plant was put into operation (the middle of December) it was not possible to obtain the number of consumers first contemplated, as the people naturally refused to take out their coal stoves and install gas ranges at this period of the year. Consequently, the above costs are usually high and are not to be taken as representing normal conditions. The total number of meters in use for this period was 70, and there are at present 272 services installed.



Above—Plant Layout

Left—Building Layout

North Manchester Operating Results

Period—February 25th to March 24th—Actual

Gallons Butane used, Corr. to 60° Fahr.		1,141.9
Butane Gas Metered, Corr. for Temp. & Press.		35,398.9 Cu. Ft.
Finished gas passed station meter, Corr. for Temp. & Press.		203,910 Cu. Ft.
Gas Registered by consumers' meters		137,000 Cu. Ft.
Used by Company (metered)		45,700 Cu. Ft.
Total Gas Sold and Used		182,700 Cu. Ft.
Unaccounted For Gas		21,210 Cu. Ft.
Per Cent Unaccounted For		11.6%
Gals. Butane per M Gas Used		5.60
Cost of Butane F.O.B No. Manchester		$ .0888 per Gal.
Cost per M Gas Sendout		
Butane	49.70c	
Pumping	14.40	
Lighting	2.40	
Water	1.00	
Labor	5.16	
Heating & Vaporizing 45,700 @ 67.5c	15.13	
Cost Gas Sendout	87.79c	
Unacc. For, 21,210 @ 87.79	9.13	
Cost of Gas Sold	96.92c	

Period—March 26th to April 25th. (Inc.)—Actual

Gallons Butane used, Corr. to 60 Deg. Fahr.	1,263.8
Butane gas metered, Corr. for Temp. & Press.	38,926.0 Cu. Ft.
Finished Gas passed station meter, corr. for Temp. & Press.	223,777 Cu. Ft.
Gas registered by consumers' meters	175,400 Cu. Ft.
Used by company (metered)	31,000 Cu. Ft.
Total Gas Sold and Used	206,400 Cu. Ft.
Unaccounted for Gas	17,377 Cu. Ft.
Unaccounted for Gas (% of Total Produced)	7.76%
Unaccounted for Gas (% of Sendout)	9.01%
Gals. Butane per M Gas Produced	5.65
Cost of Butane F. O. B. North Manchester	$ .0888 per Gal.
K.W.H. used for pumping	490

Cost per M Gas Sendout

Butane	50.17c
Pumping	14.02c
Lighting	1.93c
Water	.80c
Labor	4.69c
Heating and Vaporizing 26,000 @ 66.92	7.77c
Cost Gas Sendout	79.38c
Unaccounted For 17,377 @ 79.38	6.16c
Cost of Gas Sold	85.54c

Assuming there would be 300 customers during the first year's operation, we would expect the operating costs to approximate as follows:—

300 Consumers @ 23,000 Cu. Ft. per year				6,900 M Cu. Ft.
10% Unaccounted For				690 M Cu. Ft.
Gas used by company for Heating & Vaporization				460 M Cu. Ft.
Total Production				8,070 M Cu. Ft.
8070 MCF x 5.60 Gals. Liq. Butane per M @ $0.0888				$4,013.00
Power Rate:	First	200 KWH	7c	
	Next	300 KWH	6c	
	Next	3500 KWH	4c	
	Next	16000 KWH	3c	
Operating Expenses				
(1) Butane		49.73c per MCF		
(2) Pumping		7.33c per MCF		
(3) Lighting		0.14c per MCF		
(4) Water		0.50c per MCF		
(5) Labor		0.71c per MCF		
(6) Heating & Vaporizing		3.47c per MCF		
Cost of Gas Produced		61.88c per MCF		

Operating Expenses and Net Revenue from Sale of Butane-Air Gas to 500 Consumers at North Manchester

Population	3500	Consumers		500
Number of Houses	685	Capacity, 24 Hrs.		120
Franchise				$ 25.52
Cost of Butane Plant, Incl. Land & R. R. Siding				$19,252.78
Distribution System				
50,940 Ft. Main (actual)			$33,205.37	
500 Services & Regulators (estd.)			12,650.00	
500 Meters (estd.)			6,150.00	
				$52,005.37
Total Investment				$71,283.67
500 Consumers @ 23 M per year		11,500 M. Cu. Ft.		
Revenue @ $1.35 per M				$15,525.00
500 @ $12.00 per year, service charge				6,000.00
Gross Revenue				$21,525.00
11,500 M Cu. Ft. @ 61c			$ 7,015.00	
10% Unaccounted For			782.81	
Distribution & Office Labor			2,000.00	
Estimated that profit from Merchandise Sales would cover office expense			.....	
				$ 9,716.50
Net Operating Revenue, before Provision for Depreciation				$11,808.50
15% for Interest, Depreciation & Taxes on Gas Gen. Apparatus, Tanks, and Heating System ($12,085.34)			$ 1,812.00	
(6% Money—6½% Depreciation—2½% Taxes—15% Total)				
11% for Interest, Depreciation & Taxes on Distribution System, Building, R. R. Siding, and Miscellaneous Items ($59,198.33)			$ 6,511.82	
(6% Money—2½% Depreciation—2½% Taxes—11% Total)				
				$ 8,324.62
Net Income				$ 3,483.88
Cost of Plant per MCF of Capacity			$160.44	
Total Plant & Distribution Investment per MCF Capacity			594.03	
Cost of Plant per Consumer			38.50	
Cost of Dist. System per Consumer			104.00	
Entire Investment per Consumer			142.57	

Public Utility Advertising Association Discuss Important Subjects At Annual Meeting

A MARKEDLY interesting and important meeting was held by the Public Utilities Advertising Association in Washington May 20 and 21st, in conjunction with the twenty-sixth annual convention of the Advertising Federation of America.

The meeting opened with a business session at which reports of the President, Secretary and Treasurer were presented and various committees appointed.

Mr. P. S. Arkwright, President, Georgia Power Company, delivered the first address entitled "Our Message for the Public." He was followed by Mr. B. J. Mullaney, Vice-President, People's Gas Light & Coke Company, Chicago and President, American Gas Association, who spoke on "What the Public Doesn't Know About Utilities." He brought out the fact that advertising because of its inherently informative effect, can aptly be used for the purpose of protection of utility interests.

Other valuable and comprehensive papers presented at the Tuesday morning session were "Merchandising Better Homes" by L. A. Hawkins, Executive Engineer, General Electric Company and "Electrical Facts Needed in the American Home" by Dr. Louise Stanley, Chief, Bureau of Home Economics, U. S. Department of Agriculture.

The afternoon session was devoted to the general topic of The Public's Right to Information from the Utilities. Owen A. Conner, Financial Editor, Philadelphia Public Ledger presented "A Newspaper Viewpoint on the Utilities Obligation." He stressed cooperation between the utilities and newspapers in regard to presenting information. Other instructive and interesting addresses followed such as "The Magazine as a Channel for Utility Facts" by Joseph Hayes, Collier's Magazine; "What the Public Wants to Know," Hon. Charles A. Eaton, Congressman from New Jersey; "How Much Should the Utilities Advertise?" Edwin S. Friendly, Business Manager, The Sun, New York; and "An Agency View of Utility Advertising," Louis Munor, New England Manager, Doremus & Company, Boston, Mass.

At the Wednesday morning session the following officers were elected:

Irving M. Tuteur, McJunkin Advertising Co., Chicago, Ill., President; R. S. McCarty, Philadelphia Company, Pittsburgh, Pa., R. E. Haas, Columbia Gas & Electric Corporation, New York City and E. Frank Gardner, Midland United Corporation, Chicago, Ill., Vice-Presidents; J. R. Pershall, Public Service Company of Northern Illinois, Chicago, Ill., Secretary and Howard F. Weeks, Consolidated Gas Company, New York City, Treasurer.

"The How of Utility Advertising" was the general topic of this session. Herman Roe, Field Director, National Editorial Association, Northfield, Minnesota, spoke on "Utility Advertising in the Local Newspapers." An interesting paper presented by Henry Obermeyer, Consolidated Gas Company, New York, was entitled "The Motion Picture as an Advertising Medium." Joseph B. Groce, Edison Electric Illuminating Company, brought out the importance of the Radio as an Aid to the Utility Story. Donald M. Mackie, Commonwealth & Southern Corporation, Jackson, Michigan, told what can be done through direct mail advertising. "The Use of Customer House Organs," was the subject of a comprehensive paper presented by Howard F. Weeks, Consolidated Gas Company, New York and Earl Whitehorne, McGraw-Hill Publishing Company, New York, in his paper "Are the Utility Advertisers Doing a Good Job?" stressed the need for the human element in public utility advertising.

The above mentioned papers are to be published in booklet form by the Public Utilities Advertising Association.

When A Franchise Is Invalid

Other Important Higher Court Decisions Involving Gas

LEO T. PARKER

WHILE it is true that an ordinary gas franchise is not usually deemed a violation to anti-monopolistic laws, yet any law or provision intended to make the franchise perpetual is void. An example of this situation is found in the recent case of Oklahoma Natural Gas Corporation v. State, 284 Pac. 40.

In this case it was disclosed that a state Legislature enacted a law providing that all cities within the state should exchange a special form of permit for franchises previously issued to public utilities, and that the permits were revokable exclusively by the state Legislature.

In holding this law void, the Court explained the following law:

"The utility surrendering the franchise shall, by operation of law, receive in lieu of such surrendered franchise a permit from the state, revokable only by the Legislature. . . . Such permit in effect authorizes the converting of a limited franchise granted by a municipal corporation into a perpetual franchise, and therefore violates the Constitution which declares that perpetuities and monopolies are contrary to the genius of a free government and shall never be allowed."

State Franchise Law Held Invalid

It is well established that a state law is invalid which violates any provision of the United States or state Constitutions. Also, usually the Courts construe the meaning of a constitutional clause broadly, and *not* strictly in accordance with its technical meaning.

For illustration, in City of Cushing v. Consolidated Gas Utilities Co., 284 Pac. 38, it was disclosed that a municipality in 1912 granted a franchise to the Consolidated Gas Utilities Company. In 1929 the state Legislature enacted a law authorizing the gas companies to surrender their franchises and receive revokable permits therefor. The Consolidated Gas Company applied to the Public Utilities Commission for a revokable permit and offered to surrender its franchise.

Soon afterward the gas company, by its president and under the seal of the corporation, executed an agreement surrendering its franchise for a revokable permit.

The city filed its protest before the Corporation Commission against the granting of the revokable permit, alleging that the law enacted by the Legislature was invalid because it violates a clause in the state Constitution which provides that 25 per centum of the total numbers of electors voting at the next preceding general municipal election may present a signed petition to the chief executive officer of a municipality, demanding that a franchise be *granted, extended, or renewed.*

The counsel for the gas company argued that this clause related to the extension or renewal of franchises, and that the state law authorized the Commission to cancel the franchise and issue a permit as a substitute therefor. However, the Court held the state law void, saying:

"We hold that the Corporation Commission of the state of Oklahoma is without jurisdiction to permit the surrender of a municipal franchise, granted by a municipal corporation, and the receiving, in lieu thereof, by the holder of such franchise, of a revokable permit, as under the Constitution of this state, the municipality granting the franchise and having the right under the Constitution to grant the franchise alone has the authority by vote of the electors, as provided for in the Constitution, of extending or renewing such franchise, and this right reserved in our Constitution by the people to themselves cannot be taken away from them by the Legislature, and any act of the Legislature which attempts to do so violates the letter and spirit of our Constitution, and is therefore void."

When Purchaser of Gas Is Liable for Purchase Price

In Estey v. Southwestern Gas Co., 283 Pac. 628, it was disclosed that the Southwestern Gas Company entered into a contract with the owner of property having a gas well thereon by the terms of which the former agreed to construct a pipe line. The property owner sued to recover from the gas company the agreed purchase price per 1000 feet of gas when the gas company refused to fulfill the terms of the agreement by which it agreed to pay 7 cents per 1000 cubic feet.

The gas company attempted to avoid liability on the contention that a seller cannot sue and recover the purchase price, but that he must confine his suit for damages sustained. However, since the property owner had no sale for the gas except to the gas company, the Court indicated the latter's liability for 7 cents per 1000 cubic feet, and said:

"Granting that the real measure of damages for the breach of the contract was not that asked by plaintiff (property owner), the nature of the action is not necessarily to be determined by the petition. . . . Because of the measure of the damages stated in the demand for judgment, defendant (gas company) contends that it is a suit for the purchase price of gas sold and that there can be no recovery. . . . The Court did not mean to indicate that by reason of the form in which it was brought the action was not maintainable, but merely that if the plaintiff had been entitled to recover at all the measure of his damages would have been the amount of actual loss he could prove, which would not necessarily be the full contract price of the gas."

When Bankrupt's Debt Is Collectable

It is important to know that an old debt or gas bill, which is outlawed by statutes of limitations, may be renewed (1) if the debtor is induced to pay any small part of the old debt; (2) or if he pays interest on the old debt; (3) or if he makes a new promise to pay the old debt. This rule applies only to debts which are not discharged in bankruptcy, but which are "outlawed" by state statutes. Also, it is well established that a debtor may assume a *new obligation* to pay an old debt, from which he is legally *discharged in bankruptcy* proceedings. However, such promise to pay must be a *positive* new obligation, otherwise the bankrupt is not bound to pay.

For illustration, in Armstrong v. Neblett, 19 S. W. (2d) 362, it was disclosed that a debtor who had been discharged in bankruptcy wrote to a creditor the following letter:

"You can count on getting a part of the money I owe you this fall. I cannot yet say how much, but you are on the list to be paid first."

When the debtor failed to pay the account, the creditor filed suit contending that the above quoted letter renewed the obligation discharged in bankruptcy. However, the Court held this letter did

not renew the old debt, stating the following important law:

"It has been held by the Supreme Court of the United States that a new promise to pay a debt *discharged in bankruptcy* must be a clear, distinct, and unequivocal recognition of and renewal of the debt as a binding obligation. . . . It may be an absolute or a conditional promise, but in either case it must be unequivocal. . . . *The rule is different* in regard to the defense of the Statute of Limitations against a debt barred by the lapse of time. In that case, acts or declarations recognizing the present existence of the debt have often been held to take a case out of the statute. . . . Thus, partial payments do not operate as a new promise to pay the residue of the debt. The payment of interest will not revive the liability to pay the principal, nor is the expression of an intention to pay the debt sufficient. . . . We have concluded that the alleged promise of this debtor to pay some part of the debt he owed prior to the discharge in bankruptcy is *not* a promise to pay in language clear, distinct, and unequivocal."

When Municipality May Grant Two Valid Gas Franchises

Generally speaking, a municipality may grant two or more valid franchises to different persons or companies for the distribution and sale of gas, providing the first franchise is not *exclusive*. Also, a Public Utilities Commission may regulate and supervise public utilities but it has no creative powers.

For example, in Rayville Gas Co. v. Louisiana Public Service Commission, 125 So. 130, it was disclosed that in 1927 a municipality enacted a valid franchise to a man named James for the distribution and sale of natural gas in the town, the rate to be charged for gas being fixed at 70 cents per 1,000 cubic feet to domestic consumers. This franchise was acquired later by the Richland Gas Company which commenced the sale and distribution of gas to the inhabitants of the town and is still engaged in that business.

In 1928, by ordinance the town granted a similar franchise to the Rayville Gas Company. In this franchise the rate was fixed at 35 cents per 1,000 cubic feet to domestic consumers.

While the Rayville Gas Company was engaged in constructing a plant and laying pipes along the streets and alleys of the town, for the purpose of furnishing gas to the inhabitants, the Richland Gas Company filed suit attacking the validity of the ordinance which granted a franchise in 1928 to the Rayville Gas Company. It was contended that the Public Utilities Commission should not have approved the granting of the franchise and that it was invalid because the city had granted a franchise in 1927 to the Richland Gas Company. However, the Court held the franchise valid, saying:

"The power to grant franchise has been vested by the Legislature in the municipalities of the state and not in the Public Service Commission. . . . . The commission has the power to supervise and regulate public utilities as it finds them. It has nothing to do with creating or bringing them into existence. That is a matter for other branches of the government. . . . It is well settled that: 'On the grant of a franchise *not in terms exclusive*, there is no constitutional obligation on the state or municipality not to grant to another corporation a similar franchise, even though the latter greatly impairs or destroys the value of the former. . . . No franchise will be held exclusive unless the intention to grant an exclusive privilege clearly appears.' . . . As to the impairment of the contract implied in the first franchise granted to the Richland Gas Company by the granting of a second franchise to the Rayville Gas Company, it is well settled that: 'If a State grant no exclusive privileges to one company which it has incorporated, it impairs no contract by incorporating a second one which itself largely manages and profits by to the injury of the first'."

Court Construes Ambiguous Contract

All parties to a written contract should exercise great care that the obligations of all parties are clearly expressed. Otherwise all parties may contend that an ambiguous clause should be construed in their respective favor, the result being that legal controversy is necessary so that a Court may interpret the intended meaning of the contracting parties.

An example of this phase of the law is well illustrated by the recent case of Baker & Strawn v. Butler Bros. & Lively, 283 Pac. 556. In this case the controversy arose over the legal meaning of a clause, in a well drilling contract, as follows:

"The said well, unless sooner abandoned by direction of the party of the second part (employer) is to be drilled to the lime which is from 2,694 to 2,785 feet. . . .The consideration for which shall be $4.25 per foot. Should second party order any core drilling, the consideration for which shall be $6.25 per hour."

The driller encountered lime at 2,563 feet and he contended that he was entitled to payment of considerably more than $4.25 per foot for the drilling from the lime to the depth of 2,694 feet. The employer argued that the contract obligated the driller to drill to the depth of 2,694 feet or to lime at $4.25 per foot.

It is interesting to observe that the higher Court held the driller entitled to recover extra payment, and said:

"The primary rule in the construction of contracts is that the Court must, if possible, ascertain and give effect to the mutual intention of the parties, so far as that may be done without contravention of legal principles. Greater regard is to be had to the clear intent of the parties than to any particular words which they may have used in the expression of their intent. Innumerable decisions cited in support thereof. The record convinces us that the minds of the contracting parties met, and that they agreed, and they understood that plaintiff was to drill a gas well to the lime which had previously been found in that immediate vicinity at depths ranging from 2,694 to 2,785 feet, and we therefore hold that under the terms of the contract the plaintiffs completed the drilling when they encountered the lime at 2,563 feet."

Authority of City to Contract with Public Utility

In Commission v. Los Angeles Corporation, 50 S. Ct. Reporter 71, the Supreme Court of the United States rendered an important decision involving rates charged by Public Utilities. This Court stated the following law:

"It is possible for a state to authorize a municipal corporation by agreement to establish public service rates and thereby to suspend for a term of years not grossly excessive the exertion of governmental power by legislative action to fix just compensation to be paid for service furnished by public utilities. . . . And where a city, empowered by the state so to do, makes a contract with a public utility fixing the amounts to be paid for its service, the latter may *not* be required to serve for less *even if the specified rates are unreasonably high*. . . . And, in such case, the Courts may not relieve the utility from its obligation to serve at the agreed rates, however inadequate they may prove to be."

Oil and Gas Rights Lost by Omission of Comma in Lease Contract

Frequently, a mistake in the punctuation of a contract, irrespective of its nature, may result in great financial loss to gas companies. The omission of a comma may importantly change the legal meaning of a contract.

For instance, in Rice v. Blanton, 22 S. W. (2d) 580, a company obtained a lease on real estate, and the lease contract described the property, as follows:

"All the coal minerals and mineral products . . . all stone and the exclusive rights of way for any pipe lines. . . ."

Later the company contended that this clause included oil and gas. However, since no comma appeared between the words coal and minerals, the higher Court held that the lease contract did not include oil and gas rights, saying:

"Appellant (company) insists that the words 'all minerals and mineral products' include oil and gas. . . . If the instruments had used the words 'all minerals and mineral products,' and no more, doubtless there would be merit in the contention. This is a case where much depends on the punctuation. In the copy of the contract before us there is no comma between the words 'coal' and 'minerals.' Therefore, there is some basis for the view that the word 'coal' was not used as a noun, and therefore to designate a separate and distinct mineral, but was used as an adjective for the purpose of defining and qualifying the words 'minerals and mineral products'.. . . . It is ap-

parent, therefore, that the Court did not err in holding that the oil and gas did not pass by the deed. In reaching this conclusion, we do not overlook the fact that both the contract and deed used the words 'pipe lines,' thus indicating that oil and gas were conveyed."

Old Gas Range Campaign

J. H. REED

AN "O. G. R." campaign was an event which sold approximately 600 new gas ranges for the Atlanta Gas Light Company during the month of March.

The campaign—"O.G.R." meaning Old Gas Range, of course—was developed along interesting lines. A reward of $50 was offered for the oldest range turned in during the event, conditions being that the gas range so turned in must be in actual use in some kitchen.

Contestants were required to fill out contest blanks in the main office of the gas company giving valuable sales information to the firm.

An offer of one dollar per year was made on each stove taken in in exchange for a new stove—a twelve-year-old stove, for example, being valued at $12.00 in the trade, a fifteen-year-old stove being valued at $15.00 and so on.

A total of 575 people registered with the company for the contest, and the oldest gas range discovered in actual use was 38 years old. This range had a trade-in value of $38.00 under the contest rules, and its owner won, in addition, the $50.00 offered as a prize for the oldest range.

38 year old Gas Range

An interesting fact in connection with the campaign was that more stoves were sold than there were contestants registered, while stoves traded in ranged from five to thirty years in age, many old-timers being relegated to the junk pile.

Liberal advertising was used by the Atlanta Gas Light Company in connection with this campaign.

New Range Sale and Old Range Contest Nears End

OLD GAS RANGE CONTEST!!

It's not too late to enter your Old Gas Range in this contest and win $50 in Gold

RULES

These Rules Must Be Followed To Make Your Old Range Eligible for the Prize of Cash in Gold. Read Them Carefully.

1. Each Gas Range must be registered before 5 P. M., March 31, 1930.
2. Only Gas Ranges now in actual use on our mains are eligible for the prize.
3. To enter your gas range, secure at our office or from our representative a contest blank which must be filled out in detail.
4. This blank must be delivered to our office in person by you.
5. The winning range belongs to us to be used in any way we see fit for publicity purposes.
6. Three judges will decide the prize-winning range.

How To Tell Your Gas Range's Age and Its Trade-In Value

Nameplates and numbers will be found on almost every gas range. But the surest, easiest and best way to determine the age of your gas range is to have our representative inspect it. He will know its age and will see that you get full trade-in allowance for it.

$1.00 a Year for Old Gas Ranges Now in Service

$10.00 FOR OLD COAL OR OIL RANGES

$1.00 DOWN . . . . EASY TERMS

Crowds of people have been flowing in and out of our sales rooms during this Special Sale and Old Range Contest.

Many gas consumers have availed themselves of the opportunity to secure these generous trade-in allowances for their old gas ranges as well as coal and oil ranges.

Many old gas ranges are so worn out that they are wasteful of time and effort as well as gas. To make it easy to replace them now and get a fresh start is the purpose of these big allowances and special terms.

Here in a few words is the proposition: Trade-in allowance on old gas ranges may be figured at a dollar a year for every year the old gas range has seen service; ten years, ten dollars; twelve years, twelve dollars; fourteen years, fourteen dollars.

The allowance applies on the purchase price of any Complete Oven Control Range that replaces one of the old ranges during this sale.

Ten dollars will be allowed for old coal or oil ranges.

Only one dollar need be deposited as first payment; terms for balance will be made to suit your pocketbook.

Four Great Features of the New

ORIOLE GAS RANGES

1. **Time Control:** Set it before you leave home and it turns gas on and off while you're miles away.
2. **Temperature Regulator:** Controls the oven's heat, assuring uniform results every time without watching, waiting, worrying.
3. **Self-lighting Burners:** Turn on your burners and they light at once. No matches.
4. **Insulated Oven:** "Roasts the meat and not the cook." Keeps the kitchen as cool and comfortable as any room in the house.

NOW
is the Time to Buy Your New
ORIOLE GAS RANGE

Is Your Old Range Like One of These?

1893 MODEL

This year's range will bring you $38.00—Maybe it's yours

1902 MODEL

This year's model will pay well —Trade in allowance $15.00

1913 MODEL

Worth $12.00 as a trade-in—May never be worth this much again

1916 MODEL

We accept a lot of these —$14.00 is the trade-in value

ATLANTA GAS LIGHT CO.

Main Office PEACHTREE AT HARRIS *Jackson 5101*

WEST END 818 Gordon Street · RICH'S, Inc., 6th floor · DECATUR 116 E. Ponce de Leon

A Typical Newspaper Ad

$50 REWARD
for
O.G.R.

When found please report to us and cash reward will be paid.

ATLANTA GAS LIGHT CO.

Teaser Ad

The campaign opened the first of March with a "teaser" advertisement. This was followed at regular intervals through March by detailed announcements about the contest. And the contest closed on March 31, with the prize-winners announced about the middle of the following month.

On the whole, the campaign got and held the attention of the public to a remarkable degree and was successful from the stand-point of sales made.

Articles of incorporation were filed by the Colorado Gas & Fuel Company of Lamar, Colorado. The capitalization is $200,000 divided into 10,000 shares of no par value and 2,000 shares of stock $1 each.

Using Small Appliances To Sell Big Ones

W. B. STODDARD

Window Trim featuring Toasters

THE British Columbia Electric Railway Co., Vancouver, B. C., have recently erected a handsome new three story building in the heart of the shopping district of the city for the sole purpose of housing retail show rooms for gas and electric appliances. The entire basement, as well as considerable portions of the main and second floor, is given over to gas appliances. Gas ranges occupy the entire centre portion of this floor.

On the second floor is a model gas kitchen. Here a gas refrigerator and range have been installed, as well as arrangements for heating water by gas. On this floor, too, is a large auditorium, where cooking schools are held. A stage runs across one end, and pipes have been arranged so that gas ranges can be connected up at practically any part of the stage. A kitchen opens off this stage for the use of the domestic science staff. Illumination of the stage is provided for by two rows of lamps and a row of footlights, the latter being arranged so that they can be lowered into a box-like arrangement in the stage floor.

Gas cooking schools occupy a regular place in their educational merchandising program. Domestic science experts are retained on the regular staff, and they not only give lectures on gas cooking, but also go out to the homes of customers who have purchased ranges and teach them how to obtain the best results.

The advertising of the company is devoted not only to selling its appliances, but frequently to selling the idea of gas cooking as a whole. "The featuring of some small appliance at an attractive price," said the sales manager, "often results in the sale of major ones, or at least in securing some valuable prospects. A good example of this is the special sale we recently ran on gas toasters. These were retailed at 50c, with very little profit, of course. Our main object was to get people into the salesrooms to see them in operation. Here were different types of gas ranges, at prices to suit all purses. Whenever a woman displayed the slightest interest in one of these, its good points and convenience were explained to her and we would try to induce her to attend our cooking school, if she had not already done so. If she had not used a gas range we of course talked its cleanliness and labor saving points above all else. If she had one already we tried to sell her a later model. In that case we specialized on the deferred payments idea, and the freedom from anxiety she had with an oven heat control range.

"All appliances, by the way, are sold on the time payment plan to gas customers whose record over a period of time showed that they were prompt in settling accounts. In the case of young married couples, or families just arriving in town, appliances are also usually sold in this manner."

Just inside the entrance to the store on main floor is a large alcove fitted with gas fires and arranged like a living room. Arm chairs are provided, and here customers can select their appliances at ease, and see the various models actually connected up and burning in fireplaces similar to their own at home.

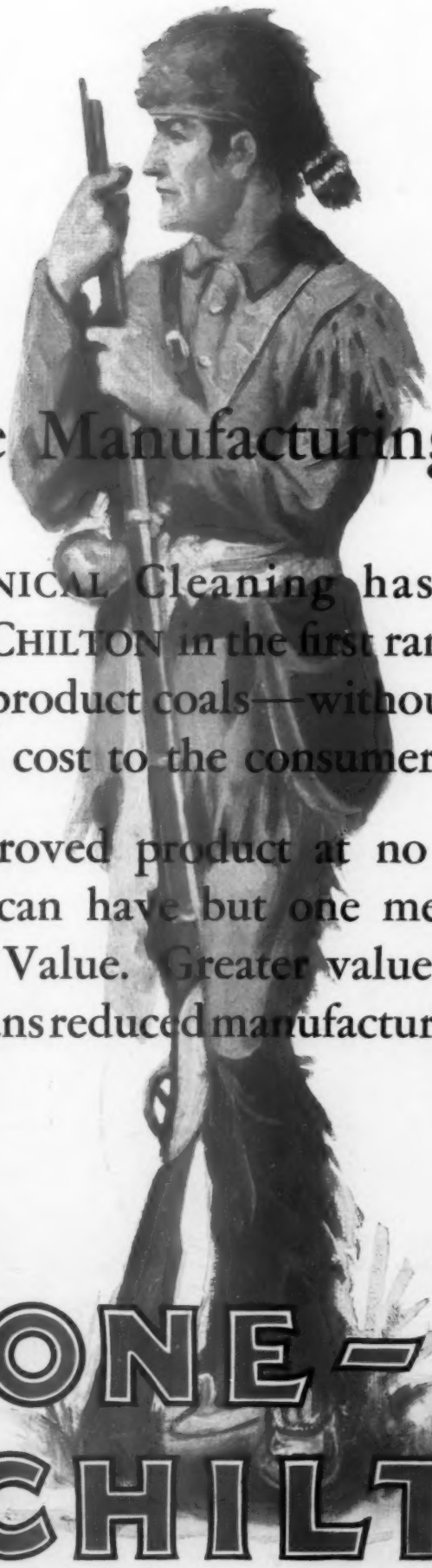
The two main windows face on the principal business street of Vancouver. These windows are at either side of the store entrance, and each has illumination giving a maximum intensity of 600 foot candles. Three spot lights are located in these windows. Window displays are recognized by the company as being of vital importance, and original ideas are being constantly developed. A good example of the clean cut displays is the one designed to stimulate the sales of gas toasters. The background was black, and so was the platform on which stood a tinted and enameled gas range. On the floor was a green tinted range, and price cards were attached to each stove. Grouped about the base of the platforms were the little popular priced gas toasters. A vase of flowers was used for decoration, and lights in the ceiling of blue, orange and white cast a variegated glow upon the contents. Several of the side windows of the salesroom carried out a striking combination of orange and black.

An idea that could be employed by many other gas companies to decided advantage is the use of stately palms and ferns, and a number of cages of sweet singing canaries in the basement salesroom devoted to the sale of major gas appliances. These not only give an air of beauty and refinement to the place but serve to disprove the oft expressed view that plants and animals do not thrive in gas heated rooms. Three different types of gas heating are used to keep the building at a comfortable temperature in winter—a gas vacuum system, gas hot air furnace, and gas hot water heating. These can all be seen in operation and patrons get a good demonstration of all methods. The company holds no brief for any particular system being mainly interested in the increased consumption of gas. The healthy condition of the birds and plants is called to the attention of any cutomer who expresses doubt as to the healthfulness of gas house heating.

The exterior of the store is one of the show places of Vancouver after dark, with its elaborate system of colored flood lighting.

Makes Wonderful Strides

The report to the shareholders of the Memphis Natural Gas Company for the first three months of 1930 show total gross earnings of $481,507 as against $194,511 for the similar period of 1929. Net earnings, after operating expenses, taxes and maintenance, not including federal income taxes, were $277,803 against $89,245, or a gain of about 211 per cent.



Reduce Manufacturing Costs

MECHANICAL Cleaning has placed BOONE-CHILTON in the first rank of Gas and By-product coals—without increasing the cost to the consumer.

An improved product at no increase in cost can have but one meaning—Greater Value. Greater value in a gas coal means reduced manufacturing costs.

BOONE-CHILTON

A Comparison in value

BOONE-CHILTON Mechanically Cleaned Coals are materially reducing manufacturing costs—cost per million B. T. U.'s of gas produced.

A comparison of the following analyses indicates the increased value resulting from mechanical cleaning.

	MECHANICALLY CLEANED	HAND CLEANED
Moisture	1.69	1.62
Fixed Carbon	57.56	57.36
Volatile Matter	35.88	35.32
Ash	4.87	5.70
Sulphur	.58	.62
B. T. U.	14,330	14,240
F. P. Ash	2750° F.	

Investigation of carbonizing results will confirm the exceptional combination of suitability and increased value.

WATER-GAS
COAL-GAS
BY-PRODUCT

Produced and Sold by
the BOONE COUNTY
COAL CORPORATION

BOONE-CHILTON
GAS COALS
BOONE COUNTY COAL CORP-PHILADELPHIA-CHICAGO

Merchandising Views and Reviews

IT IS said that in certain quarters the long extended plan of monthly payment for gas appliances is being frowned upon and that twelve has become the popular divisor except in rare instances where a special low down payment is permissible in order to arouse interest in a particular load building appliance. One of the reasons given for the discontinuance of the extended payment plan is said to be that dealers (other retailers) as a whole feel that it will speed up sales generally. The theory is that while a customer is paying for one item it is harder to sell him another when he is aware that it will take him anywhere from six to twelve months to clear-up his present account. Once, it is said, a customer reaches the point where only two or three payments are due on an appliance, he may be sold another easily if the proper arguments are presented, i.e., "now that you have become accustomed to putting aside $10.00 per month why not continue it—let us send you a gas refrigerator—you may pay for it as you use it, etc." The plan has merit, if properly handled, and it seems to us to be one that the gas man has not given very much attention to.

MANY utilities report increased sales during the first quarter of the year while some department sales are said to have been a bit off during April. This is attributed to the weather and to the fact that Easter was a bit late this year. The increase in utility company sales of home appliances is attributed to more complete selling plans being offered by the manufacturer who has sensed the fact that business may be uncovered if one digs into methods deep enough. Everyone in the selling game is seeking ideas.

IF you failed to work out a Friday the Thirteen Sale as suggested in our Merchandising Department (November 1919) you will not have another opportunity to do so until February or March 1931. Set these dates down on your tickler and in the mean time work out an "Independence Sale" for July. Stage this sale to open on Tuesday July 1 and close on Saturday July 12. Break your "Freedom From Kitchen Drudgery" advertising on Sunday June 29 or Monday June 30, if there is no Sunday edition of your local paper. Set up a big fire cracker in your window and break it open on the evening of July third. To advertise your sale and tie it into the spirit of the date have your direct mail carry a lot of fire crackers. Print your door knob hangers in red, white and blue—put some kick in 'em and your copy— advertise that no home is independent that does not have hot water service, that no woman is free who has to "pot-watch, carry garbage, fire a furnace or mess with outside drying of clothes. Use a little of the old P. T. B. showmanship and see if sales do not more than repay you for your effort.

ACROSS the northern border, in Vancouver, B. C., to be exact, the electric folks have devised a plan whereby they are selling a complete equipment (all the needed electrical appliances) for the home on a little by little payment plan spread over a period of three years. This experiment will be worth watching and trying by the gas man. What would be easier than to sell the present crop of June brides a completely equipped gas home—range, refrigerator, water heater, room heater, incinerator, clothes dryer and what have you—and let her include the payments in her monthly budget for the next three years?

WHAT'S new in selling? Nothing—although many old stunts have been garbed in new spring outfits. A dealer reports that he is building up a very large gas range business on the basis of a very low down payment, which the customer very rarely takes advantage of. This man advertises a range, that has a very good "rep" in his town, delivered and connected for a payment of 75c down, and while he is prepared to make good on it, when the customer visits his store he calls their attention to the fact that while 75c will deliver and connect said range, a payment of $10.00 or more will deliver and connect it and provide the home manager with a whole meal cooking set or a set of dishes that are regularly priced at from $12.50 to $15.00. And in most cases the dishes or cooking set are delivered with the gas range and the down payment amounts to $10.00.

FROM the firing line comes information that a number of gas company-dealer co-operative plans to merchandise appliances are making headway. Some of these activities are said to be speeding-up sales of many of the appliances that heretofore the gas man has not moved in desirable quantities. Incinerators, laundry dryers and a number of other appliances, it is said, are being sold as part of the equipment of the newly built homes; refrigerators are being displayed by many dealers and ranges and water heaters are finding a place on the display floors of hardware and furniture dealers and appliance stores. It seems that more and more folks are thus being acquainted with the better, approved appliances.

Making Progress.

MUCH talk is going the rounds as regards several plans that have to do with dealer co-operation. It is reported that one large group of properties is to get out of the merchandising business entirely as soon as they can perfect a dealer organization that is now in the making. Other companies are reported as tightening up on terms, cutting down on the length of time given customers to pay for merchandise, and that others are doing away with premiums entirely. On the other hand, a great many utility companies are playing with these old ideas on a larger scale than ever before.

NOTWITHSTANDING what some folks are saying and doing in the way of frowning on the low down payment, bonus and prize plans, we do feel that the first begets good results sometimes and that the second and third begets good results all the time. We recall a sale that a Southeastern gas com-

pany had one sweltering hot summer that advertised "99c puts a gas range in your home" and the results that this low down payment secured—and, as we think of this sale, we feel justified in saying that if water heater or gas range sales have not been up to snuff during the first five months of the year, maybe your town is ripe for a low down payment sale during the month of July. If you decide to stage a sale of this kind decide upon the least amount you feel justified in accepting as a down payment, then play that down payment up for all it is worth. You control the customer's credit and when he has not shown that he is worthy of credit, explain the facts to him and ask for a substantial down payment, on the other hand be as liberal as you can. Remember if you satisfactorily sell your customer any gas appliance, no matter what the down payment, he will make arrangements to secure the monthly payments, for the simple reason that thirty days use will convince his wife that she just can't get along without said gas appliance. To put this kind of a sale over in good fashion we would advise that it be staged for ten days or two weeks. During the first half of the sale, the sales force would be on its toes to develop prospects and the last half to close them while the offer was in force. Frequently, a big play on "tomorrow is the last day" or "Saturday is the last Chance you will have to purchase at this price, etc.," rounds up a great many folks who make it a habit to "just make it."

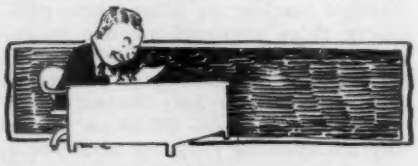
GAS Fuel Offers Economies for Summer Water Heating, so says a number of advertisements of the Consolidated Gas Co., of New York, while other companies are advertising the advantages of a Warm Bath to Cool off

HOY
LA AMA DE CASA ESCRUPULOSA
No está
SATISFECHA
Si la vajilla.—Los Platos, los Cubiertos
No han sido lavados con
AGUA CALIENTE
Instalen un Calentador
DE 17 GALONES
900 de pronto y 360 mensual
Venga a ver los calentsdores "Autohot" los mejores del Mundo. — Mantienen el agua caliente 48 horas sin gasto de combustible.
Porto Rico Gas Coke Co.
CRUZ 6.
SERVICIO EXCELENTE.

during the scorching days. These advertisements of HOT WATER service via the gas water heater are doing much to promote gas sales per meter. And the advertising of gas water heaters is not confined to the United States; Canada and many other foreign countries have boarded the Hot Water Band Wagon, Porto Rico for example via the Porto Rico Gas Coke Co., urge their customers to act "HOY" and know the "Alegria" of gas hot water service, as the advertisement reproduced on this page will testify.

GAS men who neglected to advertise gas for house heating during the months of February and March should plan to do that thing early in September when folks are returning from vacations and are having thoughts of cold weather to come and ashes and dirt, to say nothing of furnace tending. The Roper Company, The Robert folks, the Surface Combustion and the Bryant and Clow Companies are offering the gas man some very worth while merchandising ideas and helps on advertising, display and the building and development of house heating customers. These companies have everything that the gas man may need, from a full page newspaper advertisement to an insert, as well as a mass of facts that any salesman will welcome. Everybody is interested in the movement to banish smoke; a gas man's job that will be an easy one if intelligently approached and cultivated.

TO indicate an interest in new customers and in those who have fulfilled a purchase contact is an activity that is very much worth while, or we miss our guess. One gas man that we have heard of attends to this customer relation business personally. The contract department and the merchandising credit department furnish him daily with a list of new customers and customers who have made their last payment on an appliance and, while he has a form letter that he sends out, save where wholesale purchases or special industrial contracts



have been completed, he goes over the list personally and after his secretary has made the fill-ins, signs all letters. This man regards these lists of customers as a "who's who" and, safe to say, he knows to the last man who is who in his community—and it is said, he also uses this information as an activity barometer for his organization and the trend of the times in his town.

PERCOLATING the washing on the main top of your gas range seems to be taking hold, and, why not?—women do a heap of home laundry these days despite the fact of the modern laundry. Incidentally, to get an idea of just what amount of laundry is done at home, do a little home survey on this subject; you'll be surprised and you may even see the possibilities of developing this little old load building, percolating type washer. There must be something to it; hundreds of thousands of mail order catalogs can't be induced to give up valuable space to items that do not bring in money orders.

SUMMER baking contests secure a lot of interest and if you are at loss as to how to attract folks to your store such a contest might be just the thing you need. The Laclede Gas Light Company, St. Louis, has conducted these contests for a number of years with good success. The plan calls for the baking of a cake from a tested recipe of the company in some instances,

while in others, any recipe may be used. Some companies require that the cake be baked in their kitchen, others that it be baked at home and brought to the company's kitchen or demonstration room. Demonstrations are always conducted in connection with

Enter
Our
Baking Contest
Now Going On • August 16 to 20
You May Win a Range or Water Heater
(Open Only to St. Louis Women)
Another Prize Contest! Another opportunity for you to win a White Enamel nickel-trimmed Gas Range (value $175), or a Tank Water Heater with Time-O-Stat attachment! Bake a cake, or anything you like. Write on a slip of paper your name, address and a copy of the recipe which you used in baking. Bring the slip with your entry to Home Service Auditorium, Laclede Gas Bldg., between 9 A.M. and 4 P. M. any day from Monday to Friday inclusive, or to any Laclede Branch between 9 A. M. and 12 Noon, Monday, Wednesday or Friday
Announcement Party and Awarding of Prizes Laclede Gas Bldg., Monday, Aug. 23, 2 p.m.
Home Service Department
The LACLEDE Gas Light Co.
LG 376
Olive at Eleventh • • CEntral 3800

these contests and a full line of the appliances sold by the company are on display and used in connection with them. All attending the demonstrations are given recipes and cook books and where the gas company conducts classes those attending all classes are graded and, upon completion of a fixed course, are awarded a certificate. These demonstrations and classes are usually advertised by the use of newspaper and gas bill inserts.

IT IS estimated that 85% of all impressions are received through the eye and it is for this reason that the gas man is giving more and more thought to window display, store cards and price tags on merchandise. Price tags save the woman embarrassment, for no matter what her income may be the average woman is reluctant to ask prices. So, make it easy for her, mark your merchandise plainly; down payment, monthly payment, full time and cash price on EVERYTHING you display. Also, when stating a price always state the time price, down payment and monthly payment, along with the cash price of the appliance. NEVER cause a home manager to ask that embarrassing question; "May I pay for this on the monthly plan?"

SHOWMANSHIP helps to sell merchandise, just the same as it does municipalities. Remember the Natural Gas Convention? Oh, boy!—aside from food and entertainment—there was Canal Street, one hundred and seventy-one feet wide, the widest street in the world, and those lights! 1,000 watt ones, grouped in clusters of threes and mounted on thirty foot standards, and *that* twenty-one foot *pedestrian trail*, in colored terrazzo-take-off and with brass inlays. Showmanship — advertising; that is making New Orleans stand out from the motley crew. Try light and color; showmanship in your store and window—the effect on the ring of the cash register will surprise you.

SELLING home heating during "dog days" is not a half-bad idea, 'least that's the way we view it. Selling house heating or selling anything else is dependent on what urge the merchants has to place his merchandise in the home, how he visualizes the market possibilities, on how he plans to turn prospects into purchasers. And, as we review a plan produced by the Estate folks to sell Gas Heatrolas during a three weeks' drive in the month of August, we could not help but say to ourselves; "the fellow who devised this plan is imbued with the merchandising urge." The plan, briefly stated, is one to *drive hard* for a short period on a preferred list of prospects, offering them an opportunity to sign on the dotted line in August and cashing in on a dividend in December. The plan has all the ear marks of a good one and we predict that a lot of folks will buy Heatrolas in August. Reproduced on this page are two of the series of six newspaper mats that are provided for the gas man to tie-in generally with the advertising he does on his picked list.

Cash Dividends in December
for all who make this sound heating investment now
Extraordinary offer on the genuine Estate Gas Heatrola good until August 30th only
(SPACE FOR DEALER'S NAME, ADDRESS, ETC.)

Too hot
to think about Home Heating?
—then think of the COLD CASH you can save by settling this problem NOW!
Extraordinary offer on the genuine Estate Gas Heatrola good until August 30th only
(SPACE FOR DEALER'S NAME, ADDRESS, ETC.)

AN unusual installation of gas has just been completed by the Union Gas Company of Bloomington, Illinois, a special main being laid for a distance of two miles north, to accommodate the Fairview Tuberculosis Sanitarium where the patients sleep out of doors, even in the severest temperature. They are kept warm with hot water bottles which are replenished at intervals during the night. This requires a large amount of hot water and former facilities were inadequate. An eight section gas boiler has been installed with a capacity of 350 gallons and a maximum temperature of 180 degrees Fahrenheit, heat being furnished by gas. In addition to filling the rubber bottles for the patients, the hot water is used for bathing, dish washing, and other domestic purposes.

The institution has also had great difficulty in keeping cooks and helpers in the kitchen, due to the intense heat when coal stoves were used. This has now been remedied by the installation of a two section, heavy duty range to replace the old coal range. The use of gas has also been found to be more economical. The expense of hauling coal to the sanitarium was heavy. There is also a saving in the wages of a fireman who was dispensed with. The heating is also more regular than when coal was the only fuel.

EQUIPMENT NEWS

New House Service Regulator

The Fisher Governor Company is now offering to the gas industry a new house service regulator.

The Type No. 25 has the same operating features as the Fisher Series 700 Regulators which were designed and developed by the Fisher engineers three years ago for liquefied petroleum gas. These regulators have proved so successful on the liquefied gas that the same operating mechanism has been incorporated in the new Type No. 725.

The exclusive feature of the regulator is the flat cantilever operating spring which eliminates all lever, lost motion, friction, and bearings points. This special leverage gives ideal operating force due to the fact that for a given pressure under the diaphragm the force tending to close the valve increases as the valve approaches the seat. This insures positive dead end shut-off.

The Type No. 725 can be regularly furnished for initial pressure ranges from 1 lb. to 5 lbs., 5 lbs. to 25 lbs., and from 10 lbs. to 300 lbs. and suitable springs are furnished to cover a reduced pressure range from 0" to 20" of water. These can be furnished for all types of gas.

The body and cover are of high grade semi-steel castings, valve seat is bronze and the inner valve is also Bronze with special seat disc spun in place. Long life and high efficiency with a minimum of service was the aim in building the Type No. 725. However, the regulator is so constructed that all parts are easily renewable.

Circular No. 805, describing this regulator, can be obtained upon request from the Fisher Governor Company, Marshalltown, Iowa.

New Unit Heater

The Buffalo Forge Company, Buffalo, New York, have recently developed the new 16" Twin Breezo-Fin Unit Heater which is a steam unit. It is said to have the lowest B.t.u. cost of their entire line of unit heaters. When desired, one of the 16" fans may be shut down, thus lowering the steam consumption and reducing the temperature. Only one set of steam and drip connections is necessary. It also has Aerofin Heating coil, which is a lightweight, non-corrosive, high efficiency coil.

A Method of Uncrating Gas Ranges Designed to Prevent Chipping and Breakage of Enamel

The Standard Gas Equipment Corporation, 18 East 41st St., New York City, has recently issued an illustrated letter prepared on a method of uncrating gas ranges, which if carried out will prevent breakage.

All uprights and diagonals of the crate are sawed close to the bottom, taking care not to strike the stove in this sawing operation. This can be accomplished by using just one-half of the saw, that is, the portion of the saw from the center to the end, and by slightly tilting the saw, it will be impossible for the cutting edge of saw to strike the range as the portion of saw nearest the hand will strike against the nearest upright before the cutting edge of saw can strike range. The upper portion of crate can then be lifted free of all parts of the range. The crate bottom affords substantial holding members for carrying range without taking hold of the door handles, cook top, cock handles, high shelf brackets and other parts which can be readily damaged. Thus the range can be carried right into the average kitchen on the crate bottom, offering protection up to the point where range is to be installed.

The leaflet contains illustrations showing the method and copies will be furnished by the company upon request.

Wilcostat Room Temperature Control Brought Out

An automatic room temperature control for gas-fired circulators, called The Wilcostat, has been developed and is being supplied to manufacturers and distributors of circulators by The Wilcolator Company, Newark, N. J.

This device maintains room temperature within one degree of the temperature desired, and can be installed on all standard makes of circulators at the factory or while the control is actually in service.

The design of the unit is particularly rugged, although small, compact, and attractively finished to blend with the circulators to which it will be attached. Service adjustments are reduced to a minimum, and are simple to make.

According to the manufacturers, The Wilcostat will prove as useful an accessory for those making and selling gas-fired circulators as The Wilcolator Oven Heat Regulator has become in stimulating

sales of gas ranges.

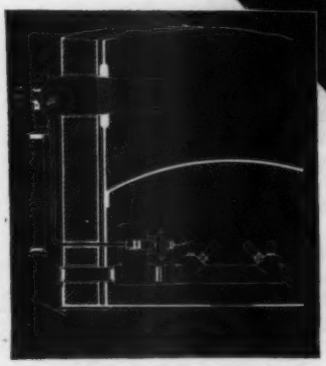
A folder on The Wilcostat will be mailed on request.

Michigan Reports Increase in Gas House-heating

House-heating with gas is extending so rapidly in Michigan that during the first quarter of 1930 it ranked first in percentage of increase among the sources of "new business" of the gas companies of of the state, reports the Michigan Public Utility Information Bureau. The number of customers using manufactured gas to heat their houses on March 31 was 1,331, a gain of 31.2 per cent over the number served by Michigan companies on March 31, 1929. Gas sales for house-heating during the first quarter were 20.8 percent greater than for the corresponding quarter in 1929. From almost the zero mark five years ago, gas heating sales have grown to more than 4½ per cent of all sales of manufactured gas made by Michigan companies furnishing 93 per cent of the state's supply. These figures are from reports made by the companies to the statistical department of the American Gas Association. They indicate that while gas house-heating in a state dependent upon manufactured gas and with a stiff winter climate, is still in the luxury stage it is making astonishing progress in establishing itself on a substantial and extensive basis.

KLIXON SAFETY PILOT

B-1226
for
Barber Burners



FOR AUTOMATIC {GAS} STORAGE WATER HEATERS

SIMPLICITY is the key point in the Klixon Safety Pilot, because it has the exclusive use of the Spencer snap-acting thermostatic disc. This bi-metallic disc snaps from concave to convex (and vice versa) at a predetermined point in the temperature range, opening and closing an attached valve with a direct and powerful action. In the case of the Klixon Safety Pilot it shuts off the main gas supply if the pilot goes out for any reason. This pilot has been approved and tested under all conditions of household use. Leading gas companies find it a profitable specialty to push,—no service is needed. If you haven't seen this safety pilot in operation, you can have no idea what SIMPLICITY really means. Can we arrange a demonstration, send folder, or what?

SPENCER THERMOSTAT CO

CAMBRIDGE · · · MASS

NEWS OF THE GAS INDUSTRY

Announce Construction of Natural Gas Pipe Line from Texas to Indiana

Announcement was made recently by Missouri-Kansas Pipe Line Co. that contracts have been released for immediate construction of a $40,000,000 natural gas pipe line, 1,250 miles long, running from Panhandle field in Texas to Indiana, via Kansas City; Springfield, Illinois; Terre Haute and Indianapolis, and connecting with the company's Kentucky pipe line system at a point near Evansville, Indiana.

Frank P. Parish, president of the Missouri-Kansas Pipe Line Co., made the following statement in connection with the building of the line:

"The Illinois Power & Light Corporation and the Missouri Power & Light Company, subsidiaries of the North American Light & Power Co., have already contracted with the Panhandle Eastern Company, subsidiary of Missouri-Kansas Pipe Line Co., for the purchase of natural gas for all the cities in Illinois and Missouri which they now are serving with artificial gas."

Mr. Parish added that all the necessary financing has been arranged for, and construction already has been started at two points on the line in Texas and Missouri. Additional gangs are being put to work at several other points, assuring completion by December first of this year.

"Approximately $25,000,000 worth of pipe and other material has been ordered from the National Supply Co. of Toledo, Ohio.

Hamilton Gas Acquires Controlling Interest in West Virginia Gas Corp.

The Hamilton Gas Company has acquired a controlling interest in the West Virginia Gas Corporation which owns and operates about 52,000 acres improved by 115 producing wells in Logan, Cabell, and Lincoln Counties, West Virginia.

The officers of the West Virginia Gas Corporation are continued in office.

Hamilton Gas Company has also acquired the properties of the Shonk Land Company, the St. Albans Oil and Gas Company, and others, comprising approximately 21,000 acres of gas territory in Boone, Kanawha, Lincoln and Putnam Counties, West Virginia, with 7 producing wells, open flow capacity in excess of 2,500,000 cubic feet per day.

Elect Directors at Annual Meeting

At the annual stockholders meeting of Standard Gas and Electric Company the following directors were elected: Arthur C. Allyn, president of A. C. Allyn and Company; Joseph H. Briggs, vice president of H. M. Byllesby and Company; H. C. Cummins, director of H. M. Byllesby and Company; Victor Emanuel, president of Albert Emanuel Company and United States Electric Power Corporation; Halford Erickson, vice president of H. M. Byllesby and Company; C. L. Fisher, vice president of Hydro-Electric Securities Corporation; H. W. Fuller, vice president of H. M. Byllesby and Company; Robert J. Graf, first vice president of H. M. Byllesby and Company; E. Carleton Cranbery, vice president of Harris, Forbes and Company, William C. Langley, of W. C. Langley and Company, Bernard W. Lynch, vice president of H. M. Byllesby and Company; M. A. Morrison, vice president of H. M. Byllesby and Company; John J. O'Brien, president of H. M. Byllesby and Company; Royal E. T. Riggs, of Seibert and Riggs; and Louis H. Seagrave, president of American Founders Corporation and United Founders Corporation.

U. G. I. Announce Acquisition & Transfer of Gas Companies

According to a joint statement issued by John E. Zimmerman, President of The United Gas Improvement Company, and Clarence H. Geist, an agreement has been entered into under which U. G. I. will acquire, through an exchange of stocks, Atlantic City Gas Company, Peoples Gas Company (N. J.) and Wilmington Gas Company. Under an arrangement with Public Service Corporation of New Jersey, the Atlantic City Gas Company and Peoples Gas Company will be transferred by U. G. I. to Public Service Corporation of New Jersey, and the acquisition of these two companies and the subsequent transfer of them to Public Service Corporation of New Jersey are subject to the approval of the Board of Public Utility Commissioners of New Jersey. Upon the consummation of the exchange, Mr. Geist will be elected a Director of U. G. I. The basis of exchange will be announced later.

The Atlantic City Gas Company supplies gas service to Atlantic City, Ventnor, Margate City, Longport, Absecon, Northfield, Linwood, Somers Point, Egg Harbor, Mays Landing and other communities; Peoples Gas Company supplies gas service to Glassboro, Vineland, Swedesboro, Hammonton, Woodstown, Pennsgrove and other communities, all in New Jersey. Wilmington Gas Company supplies gas service to Wilmington, New Castle, Richardson Park, Oak Grove, Ashley, Glynrich, Roselle, Forrest Park, Newark, Newport, Bellefonte, Claymont, Elsmere and several other communities in Delaware, and also supplies gas to companies furnishing gas service in Elkton, Maryland and Kennett Square, Pennsylvania, and vicinity.

File Articles of Reorganization

Articles of reorganization have been filed with the secretary of state in Indianapolis by the Lawrenceburg Gas Company, having a principal place of business in Lawrenceburg, Ind. The corporation has an initial capital stock of 800 shares having a declared par value of $50 each and is formed for erecting and maintaining gas works and manufacturing and distributing gas. The first board of directors is composed of A. E. Peirce, W. M. McFarlans and R. E. Maurer.

A. G. A. Endows Fellowships at Two Universities

The Natural Gas Department of the American Gas Association announces that it has endowed two fellowships in natural gas research—one at the University of West Virginia and the other at Oklahoma University.

The income allotted to each school will be applied as determined by a consultation between its faculty and the Committee on Supply Men's Fund, Natural Gas Department.

Each year the school will submit lists of recommended students and the selection of the student or students to receive it will rest in the hands of the committee.

Whether such aid will be in the nature of an undergraduate loan or a postgraduate fellowship will depend upon the merits of the various cases submitted each year.

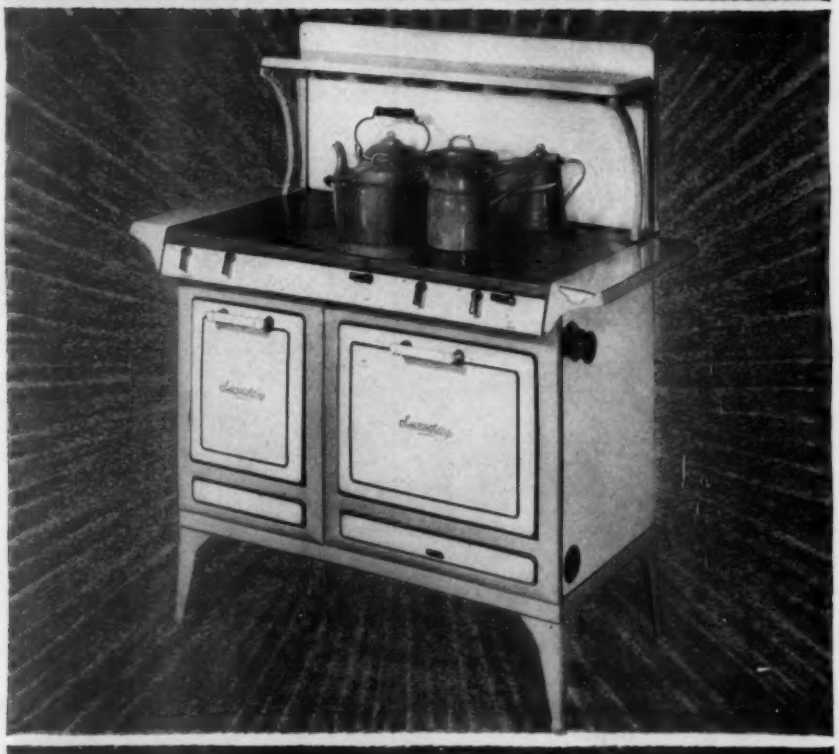
Manufactured Gas for Househeating Shows Marked Increase

An increase of 48 per cent in the consumption of manufactured gas used for house heating was made last year in the manufactured gas area, according to H. B. Johns, manager of the house-heating division of the Peoples Gas, Light and Coke Company of Chicago, who spoke on the problems of installation and operation of gas heating units at the conference in Lafayette, Ind. The conference was held under the direction of the Purdue School of Mechanical Engineering and the Purdue Engineering Extension department, co-operating with the Indiana Gas Association. It was held for the purpose of bringing together men who are interested in the use of gas-fired house heating equipment and to discuss common problems.

(News continued on page 84)

THREE NEW MODELS

with Insulated Oven



Smoothtop

GAS RANGE

CAPTURES THE FLAVOR . . . FREES THE COOK

. . . A complete *insulated* line

IN June and July . . . a national magazine advertising campaign with a 3,000,000-circulation punch tells housewives in your territory about Smoothtop's wonderful insulated oven.

Display these marvelous new Smoothtop Gas Ranges on your floor. Tie up with this national interest in insulated ovens by presenting Smoothtops. Let the housewives in your territory see Smoothtop in demonstration . . . see how Smoothtop's insulated oven keeps their kitchen as cool as outdoors . . . see how Smoothtop's 4-heat-zone top cooking adds hours to their leisure.

Get Smoothtop's merchandising portfolio. You will agree it is the most complete and effective plan ever put behind a line of gas ranges.

STANDARD GAS EQUIPMENT CORPORATION • 18 EAST 41st STREET • NEW YORK, N. Y.

Pacific Coast Distributor: Northwest Gas & Electric Equipment Co., Portland, San Francisco, Los Angeles

Consolidated Gas Announce Huge Construction Budget for 1930

The 1930 construction budget of the Consolidated Gas Company of New York and its affiliated gas and electric companies is the largest in the history of the company, and is thirty-four per cent in excess of the 1929 budget, according to an announcement made by George B. Cortelyou, President of the company.

The 1930 budget provides for an expenditure by the gas and electric companies in the Consolidated system of $139,761,342, of which $97,561,042 will be spent in 1930, since several of the approved construction projects will be started but not completed this year. The estimated expenditure in 1930 is nine per cent more than the actual gross expenditure in 1929.

Analysis of the anticipated construction expenditures of the gas and electric companies serving these territories reveals that the larger share of the construction appropriations provide for the laying of new mains and services, and the placing of new poles, cables, ducts, etc., and additional customers' meters to meet the requirements of the new dwelling houses that are being erected.

A large item in the budget is that providing for an extensive enlargement to the gas manufacturing plant at Hunts Point in the Bronx. This will be in the nature of additional coke ovens. The 1930 budget also provides for certain preliminary expenditures in connection with the erection of a "water gas" plant at Hunts Point, which will be completed in 1931.

United Gas Purchases Moran Gas Corp.

The United Gas Company of Houston, Tex., has purchased the transmission and distributing natural gas system of the Moran Gas Corporation. The Moran system contemplates more than 31 miles of transmission line, running from the White Point gas field in San Patricio County, Texas, to the towns of Taft, Gregory, Portland, Arkansas Pass and Ingleside, the latter being the site of the Humble Oil and Refining Company's refiner and ocean loading terminal on the Southwest Texas Coast.

The company owns distributing systems in all the towns named and its gas deliveries to customers, both domestic and industrial, at this time, totals approximately 4,500,000 cubic feet daily. There are a number of industrial plants served by the system, apart from the Humble properties at Ingleside.

Seek Permission to Issue Stock and Increase Rates

The Oaklandon Gas and Oil Company, Oaklandon, Ind., purveyors of natural gas to residents of that town, has petitioned the Indiana public service commission for permission to issue more capital stock and increase rates. The company asked that a hearing be held as quickly as possible. Owners are James M. and Edwin C. Berryhill.

Convention Calendar

June

16-21 Home Service Course in Domestic Gas Appliances, Cleveland, Ohio. N. J. Reiff, American Gas Association Testing Laboratory, 1032 East 62 Street, Cleveland, Ohio.

16-28 Annual industrial gas engineering course at the University of Illinois under the direction of Professor D. B. Keyes. Applications for registration should be addressed to H. G. Swearingen, Central Illinois Light Company, Peoria, Ill.

24-25 Canadian Gas Association, Halifax, Nova Scotia. G. W. Allen, 21 Astley Avenue, Toronto, Ont., secretary.

July

1-2 Michigan Gas Association. Grand Hotel, Mackinac Island, Mich. A. G. Schroeder, Grand Rapids Gas Light Co., Grand Rapids, Mich., secretary.

7-25 Summer Course for Home Service Directors, Columbia University, New York, N. Y. Dr. C. J. Lynde, Dodge Hall, Teachers College, Columbia University.

31-Aug. 1 Wisconsin Utilities Association, Commercial Section Convention, Green Bay, Wis. John N. Cadby, 105 Wells Street, Milwaukee, Wis., executive secretary.

September

9-12 Pacific Coast Gas Association, Hotel Huntington, Pasadena, Cal. Clifford Johnstone, 447 Sutter St., San Francisco, Cal. secretary.

18-19 Empire State Gas & Electric Association, Saranac Inn, N. Y., C. H. B. Chapin, Grand Central Terminal, N. Y. C., secretary.

23-24 Indiana Gas Association, Annual Convention, French Lick, Ind. F. W. Budd, Muncie, Ind., secretary-treasurer.

Villages to be Served with Natural Gas

Seventeen villages within a 100-mile radius of Binghamton, N. Y., will be served with natural gas by Columbia Gas & Electric Corporation when the old New York Transit line of the company, connecting the western Pennsylvania fields and Bayonne, New Jersey, is put in operation.

The seventeen villages, bound by franchise, are Port Dickenson, Greene, Oxford, Harpersville, Ninevah, Afton, Bainbridge, Sidney, Unadilla, Otego, Delhi, Walton, Windsor, Deposit, Hancock, Liberty and Monticello.

Appalachian Plans Purchase of Southwestern Natural Gas Stock

The Appalachian Gas Corporation has completed plans for the acquisition of a 75 per cent stock interest in the Southwestern Natural Gas Company, according to official announcement by the former company recently. While details of the plan have not yet been made public, it is reported Appalachian is to acquire 300,000 shares of the 400,000 shares which Southwestern has outstanding.

This transaction marks the second important step in the expansion plans of the Appalachian Gas Corporation which a short time ago acquired a one-third interest in Memphis Natural Gas and made contracts with leading industrial and public utility enterprises of the East to supply them with their requirements of natural gas.

Properties of Appalachian are in Ohio, Kentucky and West Virginia They consist of 372 gas wells, 313 miles of pipe lines, including gathering lines and gas rights in more than 200,000 acres of land. Appalachian also owns properties in Texas which include certain gas rights on about 215,000 acres of land.

Southwestern will sell natural gas under long term contracts to distributing companies in Muskogee, Sapulpa and Boynton, Okla., and also will furnish natural gas directly to Tulsa.

The A. O. Smith Corporation has received an order for 115 miles of gas line pipe from the Southwestern Natural Gas Corporation. The line is to run from Quinton, Okla., to surrounding towns.

Natural Gas In Mississippi

The Gulf Refining Company, drilling for oil about one mile from the state capitol, Jackson, Mississippi, uncorked a gas well making 15 million cubic feet of gas and some oil. Another well nearer the city is yielding 10 million cubic feet of gas.

Raymond Cross Elected Director of American Gas Association

Raymond Cross, president of the Ohio Fuel Gas Company, Columbus, Ohio, recently was elected a director of the American Gas Association by the Executive Board to fill a vacancy caused by the resignation of W. W. Freeman.

(News Continued on page 86)

SC RATED FURNACES ARE PROFIT BUILDERS

Why wonder if the furnace you install will live up to the promises you have made for it? Why try to figure out if the furnace will be profitable to your customer as well as yourself when you can have assurance of quality and performance?

SC Rated-Gas-Fired Furnaces take the guesswork out of heat treating performances and assure profit for your customer as well as yourself.

They operate according to pre-determined characteristics, enabling fuel consumption, process costs and production schedules to be figured in advance . . . even before the furnace is installed!

Industry is realizing the importance of *knowing* rather than guessing . . .

. . . may we tell you more about SC Rated-Gas-Fired Furnaces and their ability to build profit and good will for you?

Write today.

The Surface Combustion Co.

INCORPORATED

Subsidiary of Henry L. Doherty & Co.

2375 DORR STREET, TOLEDO, OHIO

Branch Offices in All Principal Cities

Mantle Recuperator Division
METALLIC RECUPERATORS

Webster Engineering Co.
WEBSTER BOILER BURNERS

Member of Industrial Furnace Manufacturers Association

Henry L. Doherty Awarded Walton Clark Medal

Henry L. Doherty has recently been awarded the Walton Clark Medal by the Franklin Institute "in consideration of his outstanding and valuable work in the development of the manufactured gas industry."

The Franklin Institute, established in 1824, is the oldest institution in the United States devoted to the study of applied science and mechanic arts. Its medals and certificates of award, given

Henry L. Doherty

for the purpose of advancing physical science, are prizes of world-wide recognition. Each year the Institute awards the Clark Medal after investigation by a committee of experts appointed from a group of 60 men who constitute the committee of science and the arts.

In a friendly talk that accompanied the unanimous decision to award the Clark Medal to Mr. Doherty, mention was made of the recipient's long years of service to the gas industry and his many inventions which have radically affected the development of both the electric and gas industries.

When only 23 years of age, 37 years ago, Mr. Doherty began to propose improved methods for the manufactured and natural gas industries and since then many of the practices he suggested have been adopted as standard. Altogether, Mr. Doherty has more than 150 patents to his credit. He is the inventor of the Doherty Bench Fuel Economizer used in the manufactured gas industry, and of improved methods in the gasification of coal. He also invented a lime-burning kiln which was declared superior to all previous ones by engineers.

His experience in the electrical field was almost the same, and Mr. Doherty has been permitted to see many of his ideas adopted as practices in this industry as well.

In recent years Mr. Doherty has worked long and hard to bring about conservation of the country's oil resources. He was first to outline a definite plan to prevent the waste of petroleum. Several years ago he introduced "The Doherty Unit Plan" which provides for restricted drilling under government permit. His plan has since been endorsed at meetings of the National Petroleum Institute, which he was instrumental in founding during the World War, and the American Institute of Mining and Metallurgical Engineers.

A.G.A. Starts New Household Information Service

The Household Information Service, under the direction of Miss Marie Hulser, has been added to the other staff activities of the American Gas Association Headquarters, New York.

This new service, which will become effective July 1, 1930, will consist of a monthly proof or press sheet, available to all member companies of the American Gas Association, containing articles and illustrations for use in the women's pages of newspapers in every community where gas is distributed. In addition to the proof sheets, which will be published in duplicate, one set of matrices of both illustrations and text will be furnished monthly with each subscription for the service, for local use of the subscriber.

A nominal fee will be charged for this service calculated to defray the absolute cost of preparation, and to support, at least in a measure, the development of a similar service for the household and women's magazines of national circulation, for which service there is a growing demand, and a most imminent need.

Miss Hulser, who will edit this new service, comes to the Association after several years in this field of informational news service, the past two years having been associated with the national headquarters of the "Save The Surface Campaign," in the capacity of educational publicity and editor of that organization's syndicated magazine. Previously she was associated with the New York Daily News and the publicity department of Columbia University.

Further detailed information about the service may be had by addressing Household Information Service, care Miss Hulser, American Gas Association, 420 Lexington Avenue, New York.

Phillips Petroleum Company Organizes A Gas Unit

The Phillips Petroleum Company, have organized the Phillips Natural Gas Company, a unit which will broaden the sale of the enormous amount of natural gas Phillips has access to. The new unit is capitalized at 100,000 shares of no par common stock.

Over-Head Unit Heaters are Installed

F. A. Farrar, industrial heating engineer for the Houston Gas and Fuel Company, Houston, Texas, has recently made a number of installations of over-head self-contained gas-fired heating units. Such installations were recently installed in the Western Electric building of Houston and in the National Bread Company plant of Houston.

One of the more recent installations that has won considerable comment and the attention of other restaurant and commercial prospects is that of the four units installed in the new Southland Greyhound Bus Terminal waiting room and cafe.

Each unit of this installation is individually controlled, the fans to the unit are automatically turned on when the gas is turned on, insuring an even distribution of heat. However, for summer time,

the fan units are used without effecting the heating unit.

Farrar has obtained additional prospects for this type of installation and other commercial firms have expressed interest in a similar heating and ventilating system.

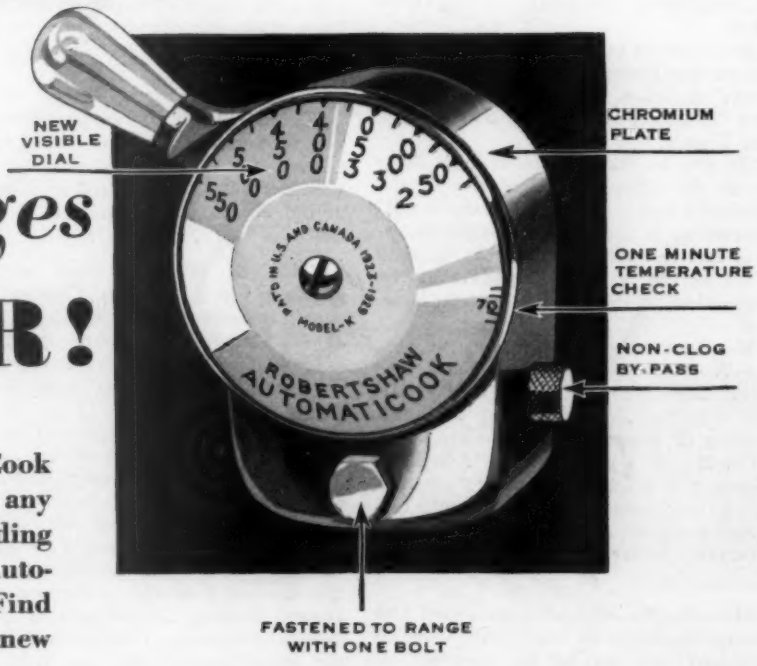
Gets Natural Gas Franchise

The city council of Fruita, Colorado, awarded the Fulton Petroleum Corporation of Seattle, Washington, a franchise to serve the city with natural gas, the gas to come from the Garmesa dome in that district.

Utility Appoints Agency to Direct Merchandise Advertising

The Central Public Service Corporation of Chicago has announced the appointment of J. Walter Thompson Company to direct its merchandise advertising.

The NEW "K" *Type* AutomatiCook *is selling Gas Ranges* FASTER!



THE new "K" Type AutomatiCook is a definite selling point on any range. And more than 100 leading makes of gas ranges will be AutomatiCook equipped this year. Find out the selling arguments of the new AutomatiCook—*now!*

It's smaller, more compact, better looking. Chromium plated. A full vision dial. An absolutely foolproof One-Minute Temperature Check. A non-clog by-pass. Only *one* bolt secures the AutomatiCook to the range. The AutomatiCook is so designed that temperature setting, calibrating and all working parts are accessible from outside the range.

Study up on the new AutomatiCook, now. Write for our descriptive literature. We'll be glad to send this literature to your salesmen and service men, too. Just send us their names. But write *now*—if you want to make selling of gas ranges easier this year!

ROBERTSHAW AutomatiCook

ROBERTSHAW THERMOSTAT COMPANY
Youngwood, Penna.

PERSONALS

Arthur M. Apmann, assistant to the director of sales and utilization, Consolidated Gas Company of New York, has resigned his position to become affiliated with the Bryant Heater and Manufacturing Company, of Cleveland, Ohio.

Mr. Apmann sailed for Europe on May 14, on the Europa, for a trip of seven weeks' duration. While abroad he will visit England, Germany, Switzerland, and France.

He was in Stuttgart from May 26 to 28, as the official representative of the American Gas Association at the annual convention of the German Gas Association, and will be in Paris from June 10 to 14 as the A. G. A. delegate at the convention of the French Gas Association.

Mr. Apmann will also attend the Second World Power Conference at Berlin, from June 15 to 25, as one of the official delegates of the College of Engineering of New York University.

On May 9, a group of Mr. Apmann's friends and associates with the Consolidated Gas Company tendered him a testimonial dinner, and presented him with a motion picture camera.

Clare N. Stannard, vice president and general manager of the Public Service Company of Colorado, has been elected first vice president of the Denver Chamber of Commerce.

W. E. Kemen, distribution engineer of the Milwaukee, Wis., Gas Light Co., was elected chairman of the gas section of the Wisconsin Utilities association at the annual convention held in Racine recently. John N. Cadby, of Milwaukee, is secretary of the organization.

Ross E. Phillips who has been with the Cities Service Company for twenty-three years, and coming to the Public Service Company of Colorado in 1926, has been appointed director of the Doherty Training School in Denver, succeeding Guy W. Faller who was appointed manager of the Cities Service securities department, Colorado division. Mr. Phillips was assistant director and previous to coming to Denver was vice president and general manager of the City Light & Power Company at Amarillo, Texas. Previous to that he was secretary-treasurer of the Lincoln Gas and Electric Company of Lincoln, Nebraska.

M. H. Frank, formerly Eastern Division manager of the Wisconsin Power & Light Co., has been appointed assistant to the vice-president and has moved from Fond du Lac to Madison where he will give particular attention to the commercial activities, public relations work, safety work, industrial development work, and publicity work.

A. P. Gale, formerly manager of the Beloit Division succeeds Mr. Frank as manager of the Eastern Division and will now have his headquarters at Fond du Lac.

Carroll A. Dean, sales manager of the Lawrence, Mass., Gas and Electric Company since February, 1928, has been made merchandise sales manager of The Worcester Electric Light Company.

H. R. Sterrett, vice-president and general manager of the New Haven, Conn., Gas Light Company, recently was elected to the Board of Directors of the Mechanics Bank, New Haven.

Collie B. Wilson, former industrial engineer for Joplin Gas Company, has been transferred to The Arkansas Natural Gas Corporation at Shreveport, La.

Mr. Wilson is a graduate of the Georgia "Tech," having graduated in the Class of '21.

In 1924 he entered the Henry L. Doherty Cadet School at Bartlesville. At the end of eight months he was sent to the Doherty House Heating School at Toledo, Ohio. He worked as a junior engineer with the Parsons Gas Company and then was transferred to the Kansas City Gas Company in the House Heating Department of the Industrial Division. This position he held for three years until his transfer to Joplin.

Mr. Wilson will make surveys and do special work relative to the organization of a New Business Department in Shreveport.

J. F. Gardiner has been appointed advertising and publicity manager of H. M. Byllesby and Company, Chicago, Ill.

J. W. Hicks has been appointed publicity director of the Byllesby Engineering and Management Corporation and Standard Gas and Electric Company, Chicago, also remaining in charge of the publications of these companies issued for executives, employees, etc.

T. P. Pfeiffer has been appointed advertising manager of the Byllesby Engineering and Management Corporation and Standard Gas and Electric Company, Chicago, Ill.

Irwin H. Witt, Gas Construction Foreman, District "C," Public Service Company of Northern Illinois, Chicago, received a $40.00 supplemental award from the Standardization and Suggestion Committee, recently, when it was learned a suggestion he submitted in 1929 had proved to be of greater value than had been originally anticipated. The original award was for five dollars.

Mr. Witt developed and suggested the use of a special device for tapping high pressure gas mains, by which it is possible to insert and remove plugs through the service saddle. It eliminates the loss of gas and simplifies precautions necessary for safety in doing the work, especially when the work is in tunnels or under pavements.

C. I. Weaver, newly-elected Vice-President and General Manager of The Ohio Fuel Gas Company, Columbus, Ohio, recently assumed his new duties at Columbus Group headquarters.

Mr. Weaver joins the Columbus Group after twenty-four years' experience in public utility and related industries, during which period he served in various capacities. Following his graduation in electrical engineering from the University of Kansas in 1906, he was associated with the Electric Company, the Westinghouse Electric Company and later with the Allied Power & Light Company, for which concern he became general sales manager.

For three years he was in charge of engineering and construction for the Eastern Michigan Power Company, and, in 1918, became Vice President and General Manager of The Ohio Edison Company at Springfield, Ohio, which position he relinquished to accept the new post in Columbus.

W. K. Burtis, formerly District Operating Foreman of the Public Service Co., of Northern Illinois, has accepted a position as Manager of the Calumet City Public Service Company of Calumet City, Illinois.

C. C. Phillips has been promoted to the position of Manager of Transmission for the Columbus, Ohio, Group Companies of Columbia System, and will have charge of the operation of compressor stations, drying plants, main lines, measurement, pressure control and the Central Ohio Shops.

Mr. Phillips has been with The Ohio Fuel Gas Company continuously since 1910, when he entered the Pipe Line Construction and Maintenance Department, after having attended East High School, Columbus, Ohio, and LaSalle University, Chicago, Illinois. Through a succession of promotions Mr. Phillips has gained a very wide knowledge of the gas business, having after his start in the Construction Department, served in the Transmission Office, being Chief Clerk in the Measurement Department from 1914 to 1925, then Assistant Superintendent, becoming Superintendent in 1927. In 1929 his department was expanded to include 12 Ohio District Meter Repair Shops, also Central Repair Shop and Bangs Warehouse.

The new position will broaden Mr. Phillips' work to include various departments and will carry well over the State of Ohio.

(Personals continued on page 90)

Sell GAS

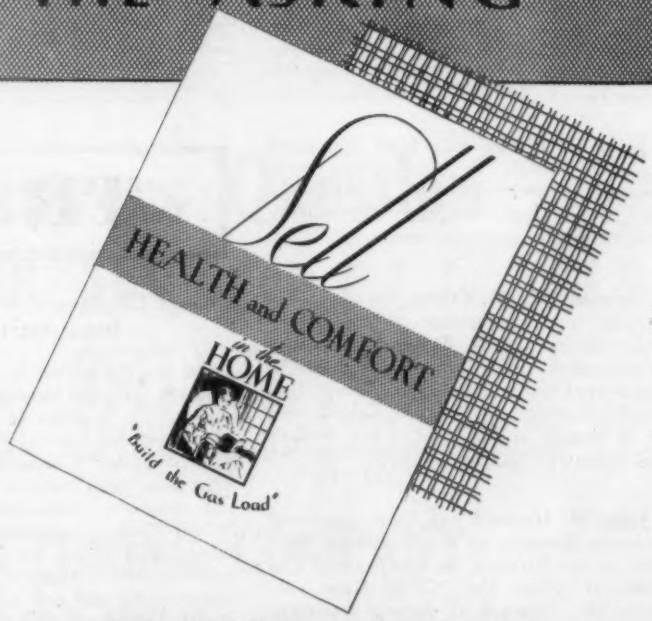
THIS COMPLETE SALES MANUAL YOURS FOR THE ASKING

Now is the time to lay your plans for building the gas load next fall and winter. And the logical means of building the gas load in your territory is through home heating by gas. This large potential market lies before you almost completely untapped. It is merely awaiting your exploitation.

To help you develop this rich market, we have prepared a complete sales manual for your use in which we explain how other gas companies are building the gas load through home heating. Also this manual shows how we are prepared to guide you and aid you in your merchandising plans.

* * *

Whether or not you have a home heating department at the present time, you should have a copy of this manual for reference. Gladly will we send you a copy without the slightest obligation. Merely write in on your letterhead and ask for our new book entitled, "SELL HEALTH AND COMFORT."



ROBERTS CONTROLLED GAS HEATING UNIT

ROBERTS-GORDON APPLIANCE CORPORATION

DELAWARE AVENUE AT TUPPER STREET

CURTISS BUILDING BUFFALO, N. Y.

TRADE MARK

A. E. Peat, for seventeen years Treasurer and Comptroller of the Southern California Gas Company, has resigned effective June 1, 1930, to accept the position as Chairman of the Board of the McEverlast Inc. in Los Angeles, manufacturers of pipe coating and paving products. Mr. Peat was Treasurer and Comptroller of the Southern California Gas Company during its growth from a few thousand customers until it has reached over 240,000 customers. He goes to the McEverlast Company as they are expanding their program with the expectation of covering the entire United States with their activities.

Samuel Insull, chairman of the Peoples Gas Light & Coke Co., Chicago, and Stuyvesant Peabody of the Board of Directors, have been elected to life memberships in the Chicago Academy of Science, according to an announcement issued by Alfred M. Baily, Director of the Academy.

R. W. Alexander, engineering assistant in the gas department of the Union Gas & Electric Company, Cincinnati, Ohio, was recently awarded the McCarter Medal for saving of a life by the prone pressure method of resuscitation.

J. G. Allen has been made Division Manager of the newly combined Beloit and Lake Geneva Divisions of the Wisconsin Power and Light Company. Mr. Allen was formerly Division Manager at Lake Geneva, Wis.

John R. Marsh has been appointed Manager, Public Relations Department Georgia Power Company, succeeding Mr. L. K. Starr, resigned. Mr. Marsh was formerly assistant manager.

Thomas W. McKenna, formerly industrial service engineer of the Blackstone Valley Gas & Electric Company, Woonsocket Division, was recently transferred to the Fall River, Mass., Gas Works Company. Mr. McKenna will be in charge of the sale of gas boilers and industrial gas appliances.

John W. Howard has been appointed Division Manager of the Northern Division of the Virginia Public Service Co., Newport News, Va. G. E. Kidd succeeds Mr. Howard as Acting Assistant Division Manager of the Eastern Division.

D. W. Maupin, who has been associated with the Missouri Power & Light Company for the past two years, has been appointed commercial manager for the Jefferson City District. He succeeds C. J. Prashaw who was recently promoted to the office of supervisory commercial manager of the company.

Edward G. Twohey of the Worcester Electric Light Company has recently been transferred to the Lawrence, Mass., Gas & Electric Company, where he will take charge of merchandise sales.

William Walk was recently appointed superintendent of the gas department of the Twin State Gas & Electric Co., Bennington, Vt. Mr. Walk was formerly in charge of the gas plant.

Scott Turner, Director, United States Bureau of Mines recently delivered the graduating day address during commencement exercises at the Colorado School of Mines.

George W. Allen, Industrial Survey Engineer, of Toronto, recently addressed the Master Plumbers' Association in Oshawa, Canada.

Mr. Allen was in Oshawa on behalf of the Public Utilities Commission to make an inspection of gas possibilities in home, school, institution, commercial and industrial establishments and to institute plans which when put into practice will bring about more equitable rates for gas, and a more satisfactory use of it.

Mr. Allen used nearly 100 lantern slides in which he depicted the rise of the gas industry from comparatively insignificant beginnings three hundred years ago, to the present time when difficulty is being experienced in various parts of the country to obtain a sufficient number of technically trained men to handle the business now demanding attention.

Obituary

ISAAC NEWTON KNAPP

I. N. Knapp, who had been connected in various capacities with The United Gas Improvement Company from 1887 to 1921 when he was retired from active duty, died in Washington, D. C., on May 25.

Born in Greenwich, Conn., in 1851, Mr. Knapp had had many experiences as cabin boy on the high seas and as apprentice machinist, before he entered Cornell University in 1871. He also studied for two years at Stevens Institute of Technology, following which, until 1884, he was a miner in California, Nevada, British Columbia and Mexico.

Following two years on sub-contract work, he entered U. G. I. employ as an erecting engineer in 1887. From 1893 to 1899 he was assistant superintendent of the Omaha (Neb.) Gas Company, then a U. G. I. subsidiary, and from 1900 to 1905 he was prospecting for and producing oil and gas in Kansas. This was followed by seven years of prospecting in the Southern Louisiana oil fields, and in 1914 he was returned to the Philadelphia office as a consulting engineer, where he remained until his retirement in 1921.

TRADE NEWS

United Engineers & Constructors, Inc., Activities

The St. Louis County Gas Company of Webster Groves, Missouri, has awarded contract for erection at their Shrewbury, Mo. Plant, for one (1) 9'0" I. D. Mechanical Generator Carburetted Water Gas Apparatus, with exhaust steam manifold, and auxiliary equipment, also one (1) 7'6"x22'0" U. G. I. Vertical Blast Gas Waste Heat Boiler, with platforms, stack, and boiler fixtures; Smoot Steam Accumulator and one (1) U. G. I. 8-cam Model "B" Automatic Control Machine.

The Connecticut Light & Power Company of Waterbury, Conn., has awarded contract for necessary equipment and plant changes to utilize The U. G. I. Heavy Oil System, for their plant at Norwalk, Conn., also contract for Cottrell electrical precipitation equipment with necessary by-pass, foundation, substation enclosure, steam and drain piping and to furnish, deliver and install one (1) U. G. I. Vertical Blast Gas Waste Heat Boiler, with necessary foundations, changes to floor, building changes, piping and washer tar batter.

The Allentown-Bethlehem Gas Company, of Allentown, Pa., has awarded contract to furnish, deliver, and install at the Allentown gas plant, one gas compressor, auxiliary equipment, and changes to building.

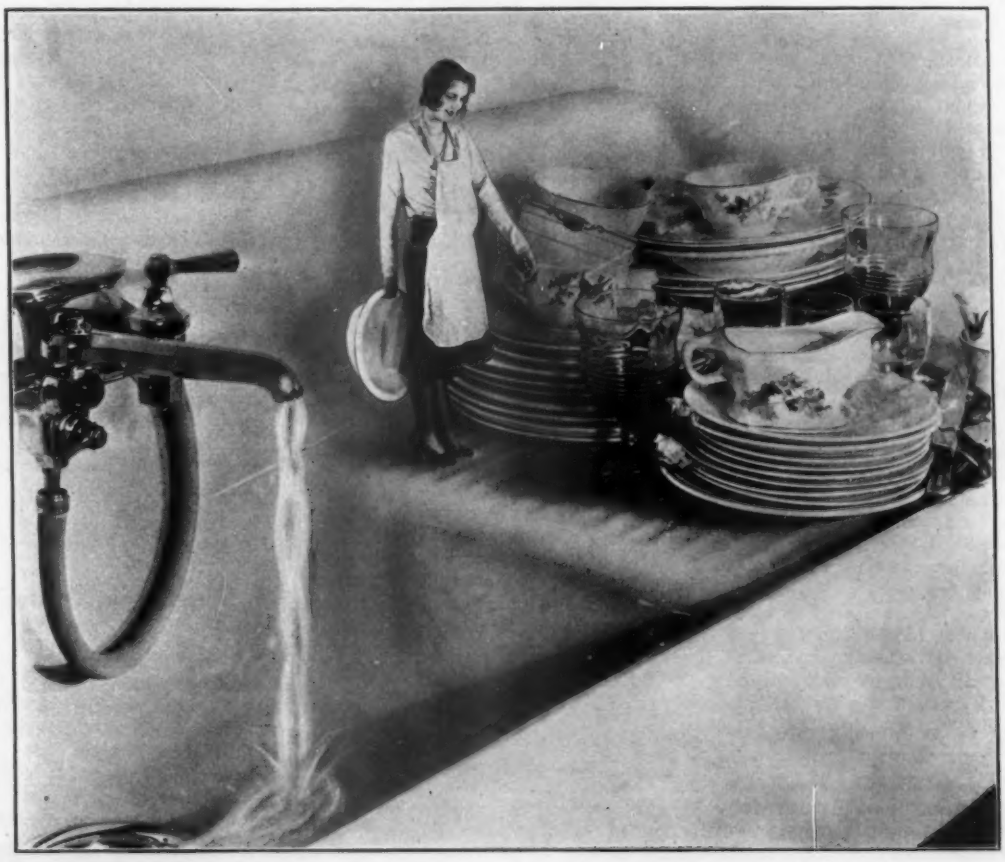
The Ramapo Gas Corporation of Suffern, N. Y., has awarded contract for the laying of 2", 4" and 6" mains as specified from time to time.

The Philadelphia Electric Company, of Philadelphia, Pa. has awarded contract to furnish and construct 50,640 feet of 6" welded steel main between Langhorne and Morrisville, Penna.

The Consumers Gas Company, of Reading, Penna. has awarded contract to furnish and construct 3,908 feet of 8" welded steel main on Windsor Street, Reading, Pa., also to furnish and construct 12,200 feet of 8" welded steel main with Dresser joints, between Reading Gas Plant and Boulevard Bridge and Blair Avenue, Reading, as well as to furnish and construct 1,750 feet of 8" welded steel main in West Reading, Penna.

The Bangor Gas Light Company of Bangor, Maine, has awarded contract to furnish and construct 14½ miles of welded steel pipe from Bangor, Maine to Old Town Maine, 10½ miles of 3", and 4 miles to be 2".

(*Trade news continued on page 92*)



RUUD Plan Answers Question—

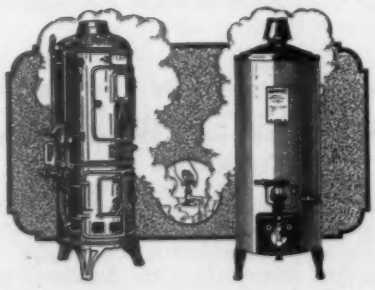
? ? ? ? SUMMER SLUMP ? ? ? ?

When the heat is bouncing from the sidewalks and your salesmen are looking for shady spots, what can be done to keep water heater sales in high gear?
The answer is the RUUD Summer Sales Plan, made to order for gas company use, complete in every detail and READY NOW!
This new sales-help is Part TWO of the famous 1930 TEN TO ONE program and the finest thing to stimulate summer selling you've ever seen. Write for it!

RUUD MANUFACTURING COMPANY

Pittsburgh, Pa.

TORONTO HAMBURG LONDON



Summer-time is water heater time. Competition of other fuels is at low ebb. The public needs MORE hot water in hot weather. Sell it to them.

Seven new refinements now feature RUUD-AUTO-HOT, the world's leading storage water heater. All are described in a new broadside, now ready, which will be sent on request.

Koppers Company Building Additional Becker Ovens at Hunts Point, N. Y.

The Koppers Construction Company is designing and building an addition to the Becker Oven Plant of the Consolidated Gas Company at Hunts Point, N. Y.

The addition will include thirty-seven producer gas under-fired Becker ovens with a daily coal capacity of approximately nine hundred tons. There will also be included the necessary extensions and additions to by-product and material handling plants.

Joins Pittsburgh Equitable Sales Force

L. W. Mahaffey has joined the sales staff of the Pittsburgh Equitable Meter Company, Columbia, S. C., office. Mr. Mahaffey was graduated in civil engineering from the University of South Carolina. For several years he was assistant testing engineer in the South Carolina Highway Laboratory. His actual experience makes him a valuable man to the company. His territory will include the state of Alabama and part of Florida.

Brown Instrument Co. Announce Change of Chicago Address

The Brown Instrument Company, Philadelphia, Pa., announces the consolidation of its Chicago Sales Office and Midwestern Factory Branch in new quarters located at 155 East Superior Street, Chicago, Illinois. Practically double their former space has been provided in line with the growth of business throughout the Middle West, and a large stock of replacement material is carried on hand ready for prompt shipment.

Semet-Solvay Engineering Co. Install Water Gas Machine at Zilwaukee, Mich.—Other Installations

A new carburetor water gas machine with backrun and other auxiliary equipment are being installed for Consumers Power Company, Zilwaukee, Mich. A washer cooler with necessary piping is being installed at the gas plant of the Jersey Central Power & Light Company, Long Branch, N. J. An ammonia conversion and storage installation has built and put in operation for the Furness Corporation, Gloucester, N. J. The water gas plant of the Conewago Gas Company, Hanover, Pa., is being remodeled. A backrun will be installed on the water gas machine. New gas cleaning equipment and other apparatus is being installed in the Kitchener, Ont. gas plant. A fuel handling system is being erected at the gas plant of the Connecticut Power Company in New London, Conn.

E. A. Doyle Elected President of American Welding Society

E. A. Doyle, Consulting Engineer of The Linde Air Products Company was elected President of the American Welding Society at the recent annual meeting of the society.

New Pipe Protection Booklet

"The Protection of Oil and Gas Lines," is the title of a booklet which has just been issued by the Wailes Dove-Hermiston Corporation. One chapter of the new booklet is devoted to illustrations showing some large oil and gas trunk line systems that have been safeguarded against corrosion.

The manufactured gas industry is represented by installations of many of the leading companies which use proven protective materials for extending and safeguarding the life of steel distribution mains and service pipes. Illustrations of numerous large steel water mains installed in various parts of the country show that the same practice is followed in the water works field.

An interesting tie-up with other fields likewise faced with the corrosion problem is given in a section of the booklet containing pictures of several famous structures which have been protected by the same coatings.

The causes of corrosion, the need for positive protection and the 14 requirements of an effective pipe coating are described in the new booklet. Practical recommendations are given concerning the best type of protection for installations of various kinds.

The several methods of application which have proved most effective and most economical under various circumstances are described. These include the application of a shop-coat at the pipe mill or shop, and coating of services and other small-diameter pipe by the dipping method in storage yards or in the field. Field applications of priming coats and enamel are described in some detail, including applications by brushing, by the canvas sling or "rag" method, and by means of the patented Rolling Rigs used extensively for coating large-diameter pipe.

The booklet is being distributed upon request by the Wailes Dove-Hermiston Corporation, 17 Battery Place, New York City. Copies also may be obtained upon application to any of the company's branch offices or agents.

New Carbide and Carbon Building in Kansas City

The new Carbide and Carbon Building at 910 Baltimore Avenue, Kansas City, Missouri, is a tribute to the growing industrial importance of the Southwest and is a direct indication of the constantly increasing use of the oxyacetylene welding and cutting process in this region. It permits the Union Carbide and Carbon Corporation to consolidate the Kansas City offices of its various units in one building so as to provide improved facilities for serving its customers in this district

The units of the Corporation now housed in the eleven story building include: The Linde Air Products Company, The Prest-O-Lite Company, Inc., Oxweld Acetylene Company, and Union Carbide Sales Company. In addition to having its district offices here Oxweld Acetylene Company will maintain an apparatus and supply stock in the basement of the building. Other units of the Corporation, J. B. Colt Company, manufacturer of farm and home acetylene lighting and cooking equipment and National Carbon Company, Inc., national distributor of Eveready products will also maintain Kansas City offices in the building.

New Bryant Heater Bulletins Issued

Three comprehensive and attractive handbooks have recently been issued by the Bryant Heater & Mfg. Company, Cleveland, Ohio. Catalog 29 F 4 deals with the heating of buildings with Bryant gas boilers. It contains a detailed description of all models of Bryant gas boilers and controls as well as technical information of value to the architect and heating engineer. This bulletin also contains attractive illustrations in colors showing the possibilities of basement space for combination laundry and heater room, recreation room, play room, etc.

Bryant warm air furnaces are described in Catalog 30 b 1. They can be used with warm air heating systems of either the gravity or forced air type, and are completely automatic. Many useful tables are included, as well as specifications, dimensions, etc.

Catalog 29 d 22 deals with heating of water with Bryant gas boilers. This contains construction details, storage tank specifications, dimensional drawings and other useful information.

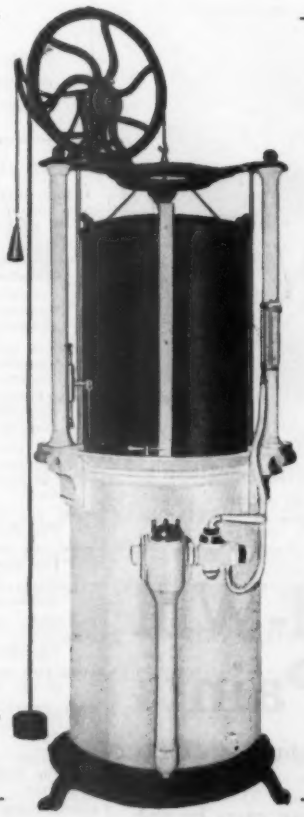
Copies of these catalogs may be obtained from the company upon request.

J. H. Farrar Transferred

J. H. Farrar, who until recently has been working from the Tulsa, Okla., office of the Pittsburgh Equitable Meter Company, has been transferred back to the main office at Pittsburgh where he will specialize in the territory of central Pennsylvania, northern Maryland and western Delaware. Mr. Farrar is a University of Pittsburgh man and worked for the Carnegie Steel Company in the blast furnace department at the Duquesne plant. He also took the instruction course in the Pittsburgh Equitable Meter factory, which includes work in practically every department of the plant.

SUPERIOR

Gas Meters
Provers
Service Cleaners
Diaphragms
Repairs



SUPERIOR METER CO.
167-41st Street
Brooklyn, N. Y.

BAROMETERS

PHILADELPHIA, THE WORKSHOP OF THE WORLD
has 14,000 Manufacturing Establishments of which many have World-Wide Reputations.

"PRINCO" STANDARD FORTIN MERCURIAL BAROMETERS

are in World-Wide use because they, too, have a "World-Wide Reputation"

THEY ARE GOOD BAROMETERS
THEY ARE REASONABLE IN PRICE!

For more than a decade they have been made in such manner that they can be shipped safely and successfully wherever there is a common carrier. This has been recognized as an achievement in Barometry.

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1439 BRANDYWINE STREET - - - - - PHILADELPHIA, PA.

ROCHESTER GAS & ELECTRIC CORP., Brighton
A particularly effective example of low visibility, obtained by the use of CE-CO Gas Holder Paint, in a fine residential neighborhood

Building Good-Will With CE-CO Paints

Objections are often raised to the unsightliness of gas holders in residential or business sections.

These objections can be overcome in many cases by the application of CE-CO Gas Holder Paints, made especially for the purpose of eliminating the ugliness of these holders, or tanks, and at the same time protecting them against rust and corrosion.

The following color schemes are suggested:

1—Large or small holders in cities, surrounded with buildings:
CE-CO Public Service Drab, Beige Brown, or No. 31 Williamsport Red.

2—Large holders in suburbs; surroundings mainly trees and fields; sky background:
CE-CO Low Visibility Gray, with Public Service Green or a Dark Gray around the base.

3—Small holders in suburban communities:
CE-CO Public Service Green or Low Visibility Gray.

4—Small holders in cities:
CE-CO Public Service Drab or No. 31 Williamsport Red.

For your guidance send for color card 3-A and Bulletins "Color Harmony" and "Low Visibility."

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Cheesman-Elliot Company, Inc.

Established 1876

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639-647 Kent Avenue, Brooklyn, N. Y.

Works at Brooklyn, N. Y. and Williamsport, Pa.

TRADE CATALOGS

Published by manufacturers of Gas Equipment and Appliances for you. Order by number, using coupon on Page 103.

PLANT EQUIPMENT

A. B. C. SELF CLINKERING GENERATOR
The Western Gas Construction Co. 88

"AMERICAN" GAS AND METER TESTING APPARATUS
American Meter Co. 320

AUTOMATIC GOVERNORS
Connelly Iron Sponge & Governor Co. 289

BALANCE GOVERNORS
Connelly Iron Sponge & Governor Co. 290

BACK PRESSURE VALVES
Connelly Iron Sponge & Governor Co. 295

BECKER TYPE COMBUSTION COKE & GAS OVENS
The Koppers Construction Co. 235

B. H. CO. THICKENER
The Bartlett Hayward Co. 56

B. H. CO. VERTICAL SCRUBBER
The Bartlett Hayward Co. 57

CALORIMETRY
American Meter Co. 321

CAMPBELL SOLID METAL WINDOW, THE
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COAL AND ASHES GATES
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COAL PRODUCTS TREE
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COKE FIRED GAS PRODUCER OPERATION
The Koppers Construction Co. 236

CONTINUOUS VERTICAL COMBINATION OVENS
The Koppers Construction Company 238

COUNTER BALANCE MANHOLES
Connelly Iron Sponge & Governor Co. 299

DEHYDRATION OF MANUFACTURED GAS
The Koppers Construction Co. 237

DISTRICT L. C. GOVERNORS
Connelly Iron Sponge & Governor Co. 293

DR. OTT-LUX-GAS TESTER
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DRY QUENCHING
Dry Quenching Equipment Corp. 206

DRY QUENCHING OF COKE
Dry Quenching Equipment Corp. 204

DUPLEX VALVES
Andale Co. 45

FAST'S FLEXIPLE COUPLING
The Bartlett Hayward Co. 54

FORGED STEEL GATE VALVES
Darling Valve & Mfg. Co 20

GAS CONDENSERS
Isbell Porter Co. 140

GAS COOLER
Andale Co. 46

GAS DISTRIBUTION
The U. G. I. Contracting Co. 76

GAS FILTERS
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GAS MEASUREMENT
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LA MONT WASTE HEAT STEAM GENERATOR
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MACKENZIE EXHAUSTERS
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The Koppers Construction Co. 242

NEW METHODS OF GAS PURIFICATION
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SERVICE D. C. GOVERNORS
Connelly Iron Sponge & Governor Co. 294

SHAVING SCRUBBERS
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SMOOT CONTROL OF COMBUSTION AS APPLIED TO TRAVELING GRATE STOKERS
Smoot Engineering Corpn. 60

SMOOT CONTROL AS APPLIED TO UNDERFEED STOKERS
Smoot Engineering Corpn. 67

SMOOT CONTROL AS APPLIED TO WATER GAS SETS
Smoot Engineering Corpn. 62

SMOOT STEAM ACCUMULATOR AND CONTROL SYSTEM
Smoot Engineering Corpn. 66

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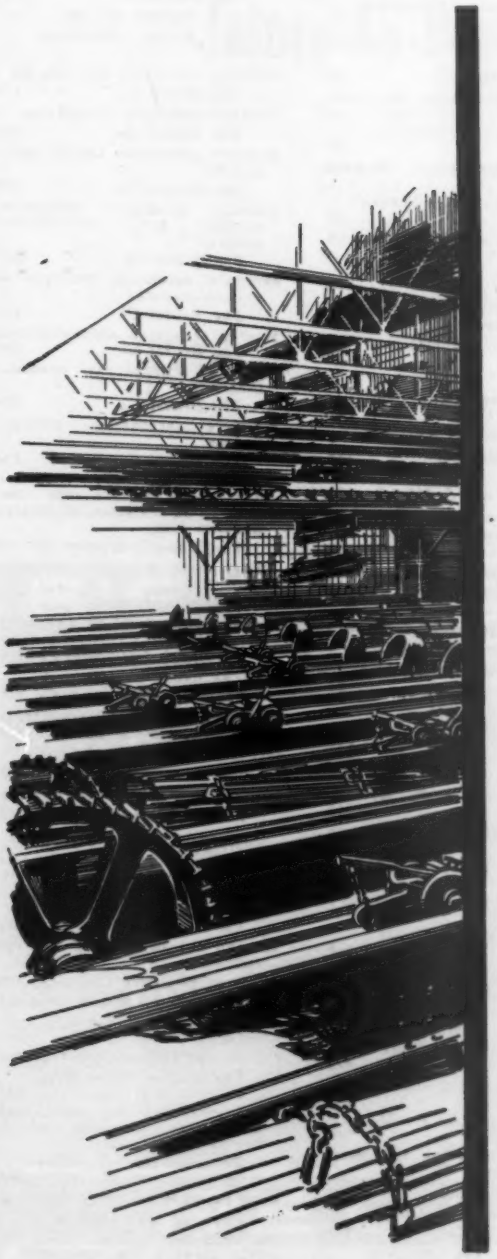
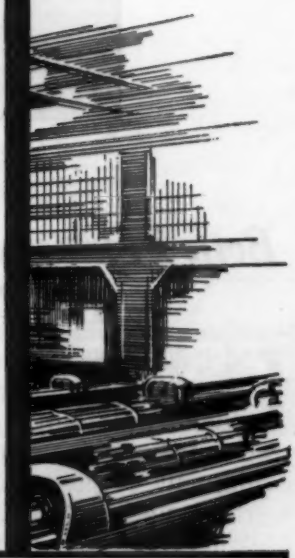
COLD DRAWN...



THE drawing-tongs of the draw bench grip the "pointed" end of the cold Seamless tube or pipe and draw it through a round die of reduced circumference while a mandrel, working on the inside of the pipe accurately controls the proper dimension of wall thickness. This process is repeated (with an annealing operation for each drawing) through dies of decreasing diameters until the pipe or tube is of the required diameters and wall thickness.

The same high standards of quality and workmanship are maintained in Pittsburgh cold-drawn products as in Pittsburgh Seamless hot-rolled pipe and tubing.



From ore to finished pipe or tube... Pittsburgh Seamless is the product of the Company's resources and skill.

Pittsburgh Steel Products Co.
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PIPE TUBING

1018

Jack through ARMCO Corrugated Iron PIPE

One of four openings obtained by jacking Armco Corrugated Iron Pipe under 25 railroad tracks for installation of gas mains at Buffalo, N. Y.

Both Product and Method are BETTER!

IN itself the Armco Jacking Method is a revolutionary improvement over old methods of providing openings under streets or tracks for mains, conduits and other service equipment. It keeps traffic moving because all work is underground. It protects adjoining buildings against injury because there is no settlement.

The Armco Jacking Method, developed by Armco engineers, saves from 30 per cent to 50 per cent of the costs of open trenching!

Combine the advantages of this new method with the superiority of the product used—Armco Corrugated Iron Pipe—and it is easy to see why gas and public utility companies throughout the country are abandoning older methods.

Armco Corrugated Iron Pipe, of which more than 50,000,000 feet are in use, holds alone the record of 24 years service in the ground—in "Nature's laboratory." It endures! Write for new literature on the Armco Jacking Method.

ARMCO CULVERT MANUFACTURERS ASSOCIATION
Middletown, Ohio

ARMCO

C, 1930, A.C.M.A.

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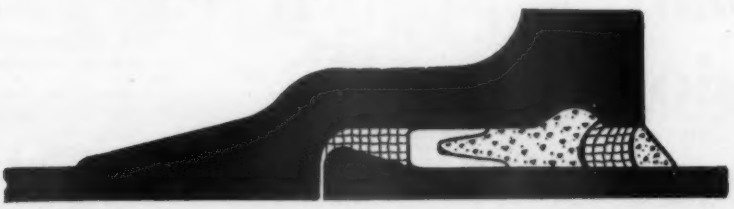

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Joints As Permanent As Cast Iron Pipe

For New Mains or Repairing Old Joints

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BIG ONES OR LITTLE ONES -A COMPLETE LINE OF DEPENDABLE CF

1 BODY FOR TWENTY-FOUR-INCH LOW PRESSURE REGULATOR.

2 A TEN-INCH DIFFERENTIAL REGULATOR.

3 A THREE-FOURTHS INCH HIGH PRESSURE REGULATOR.

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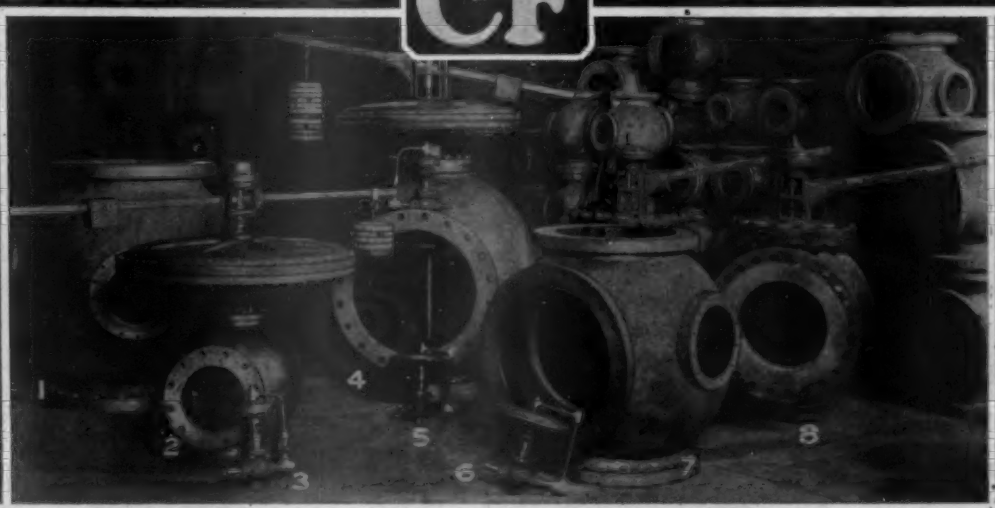

5 ONE-INCH HOUSE REGULATOR.

6 ONE AND ONE HALF INCH HOUSE REGULATOR.

7 BODY OF A TWENTY-INCH WEIGHTED ILLUMINATING REGULATOR.

8 A SIXTEEN-INCH HIGH PRESSURE REGULATOR.

REGULATORS

GREATER dependability and accuracy has been the Chaplin-Fulton goal for over forty years of experience in controlling gas pressure. Being today's standard is the result of ceaseless effort to improve design, materials, and workmanship.

During this time there have been developed many varying types of regulators—enough to meet every major requirement of gas control. Chaplin-Fulton therefore represents a most complete and a highly dependable line of products. Catalogues are available which describe each Regulator.

The Chaplin-Fulton Mfg. Company
ORGANIZED 1884 — OLDEST BUILDERS OF GAS REGULATORS IN THE COUNTRY. BUILT IN ALL SIZES, FROM 1 INCH TO 24 INCHES; FOR ALL SERVICES, 1 OZ. UP TO 2,000 LBS. PRESSURE TO SQUARE INCH
28-40 Penn Avenue, Pittsburgh, Pa.

STOP Corrosion!

Protect Your Plant and Equipment

QUIGLEY TRIPLE-A -AAA-

Triple-A on structural steel concrete foundations and piping of cooling systems increases their life.

Protective Coatings prevent corrosion of iron, steel and other metals. They waterproof and protect surfaces of concrete, stone, plaster, cork, etc. They meet the demand for *a real protective coating under the most severe conditions.* They are alkali and waterproof and resist the action of acids, acid fumes and vapors.

Triple-A Coatings in Black and Colors cling tight to the surface and fill the surface pores. Applied like paint. What is your corrosion problem? Ask for booklet CG-141 and service record in your industry.

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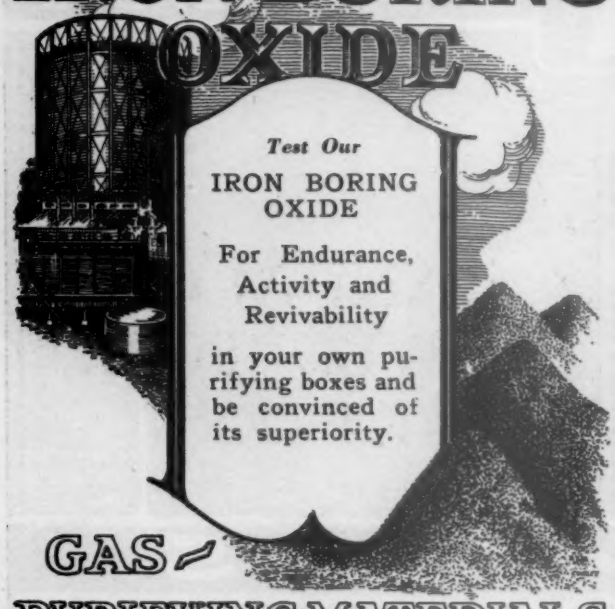

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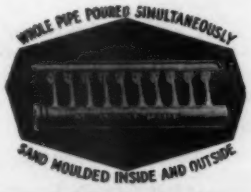

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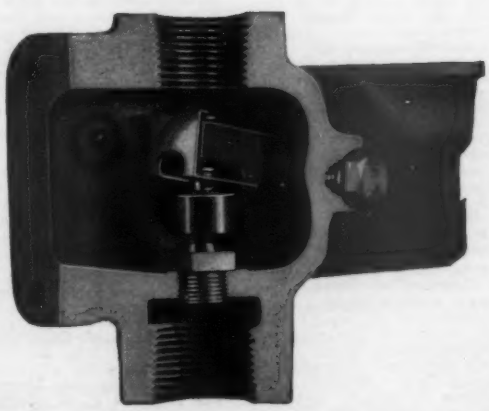

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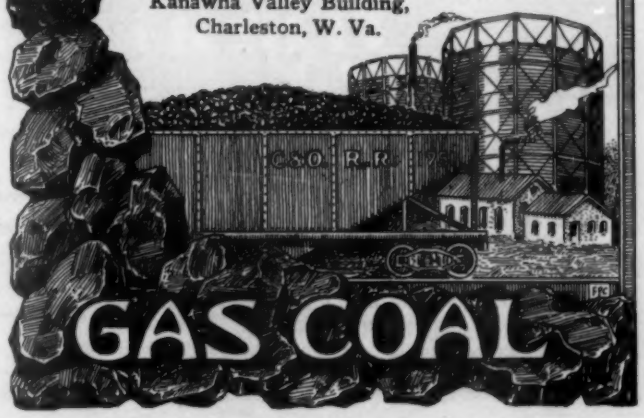

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Riter-Conley Company.
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West Gas Improvement Co.
The Western Gas Construction Company.
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The Gas Machinery Co.
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FILES (Visible)
Remington Rand, Inc.

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General Refractories Co.
Quigley Furnace Specialties Co., Inc.
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Improved Equipment-Russell Engineering Corp.
United Engineers & Constructors, Inc.
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The Stacey Mfg. Co.
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The Western Gas Construction Company.
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Cast Iron Pipe Research Association.

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Semet-Solvay Engineering Corp.
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Geo. D. Roper Corp.
Gas Soldering
American Meter Co.

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Metric Metal Works.

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Pittsburgh Equitable Meter Co.
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Superior Meter Co.

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Philfuels Co.
United Engineers & Constructors, Inc.
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Connelly Iron Sponge & Governor Co.

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Connelly Iron Sponge & Governor Co.

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The Bristol Company.
Brown Instrument Co., The
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Lambert Meter Co.
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Superior Meter Co.
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Precision Thermometer & Instrument Company.
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Brown Instrument Co.
Precision Thermometer & Instrument Company.
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Precision Thermometer & Instrument Company.

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Safety Gas Main Stopper Co.

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Connelly Iron Sponge & Governor Co.
Gas Industries Laboratories.
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Reynolds Gas Regulator Co.
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Stacey Bros. Gas Construction Co.
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HOWARD AUTOMATIC CHARGERS
The Western Gas Construction Company.

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Cruse Kemper Co.
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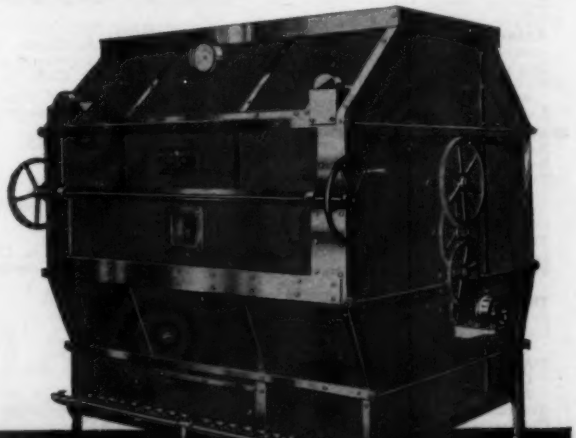

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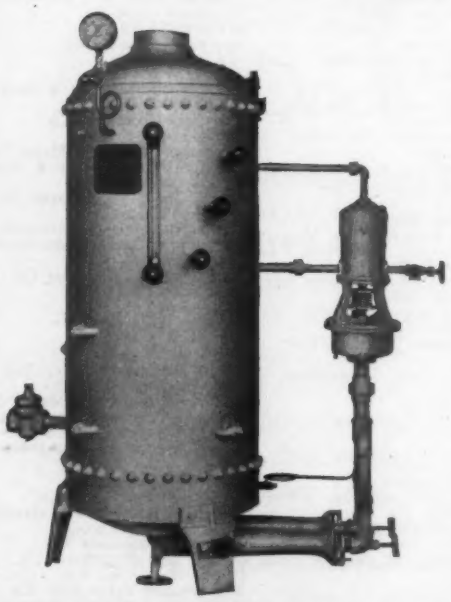

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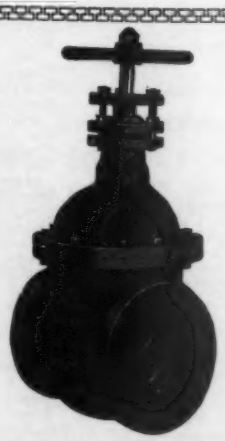

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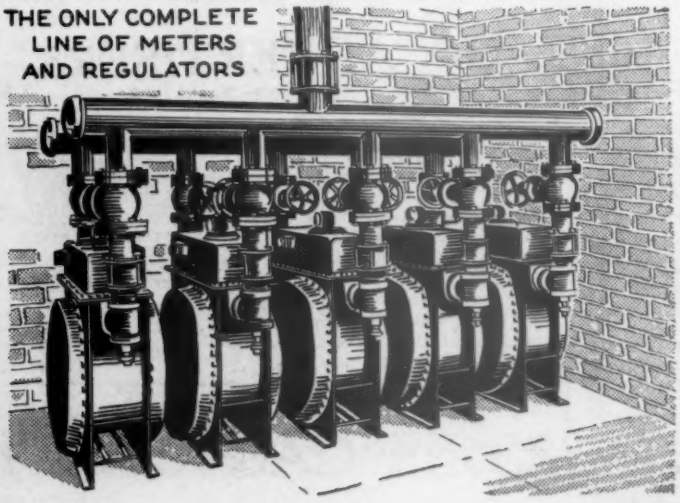

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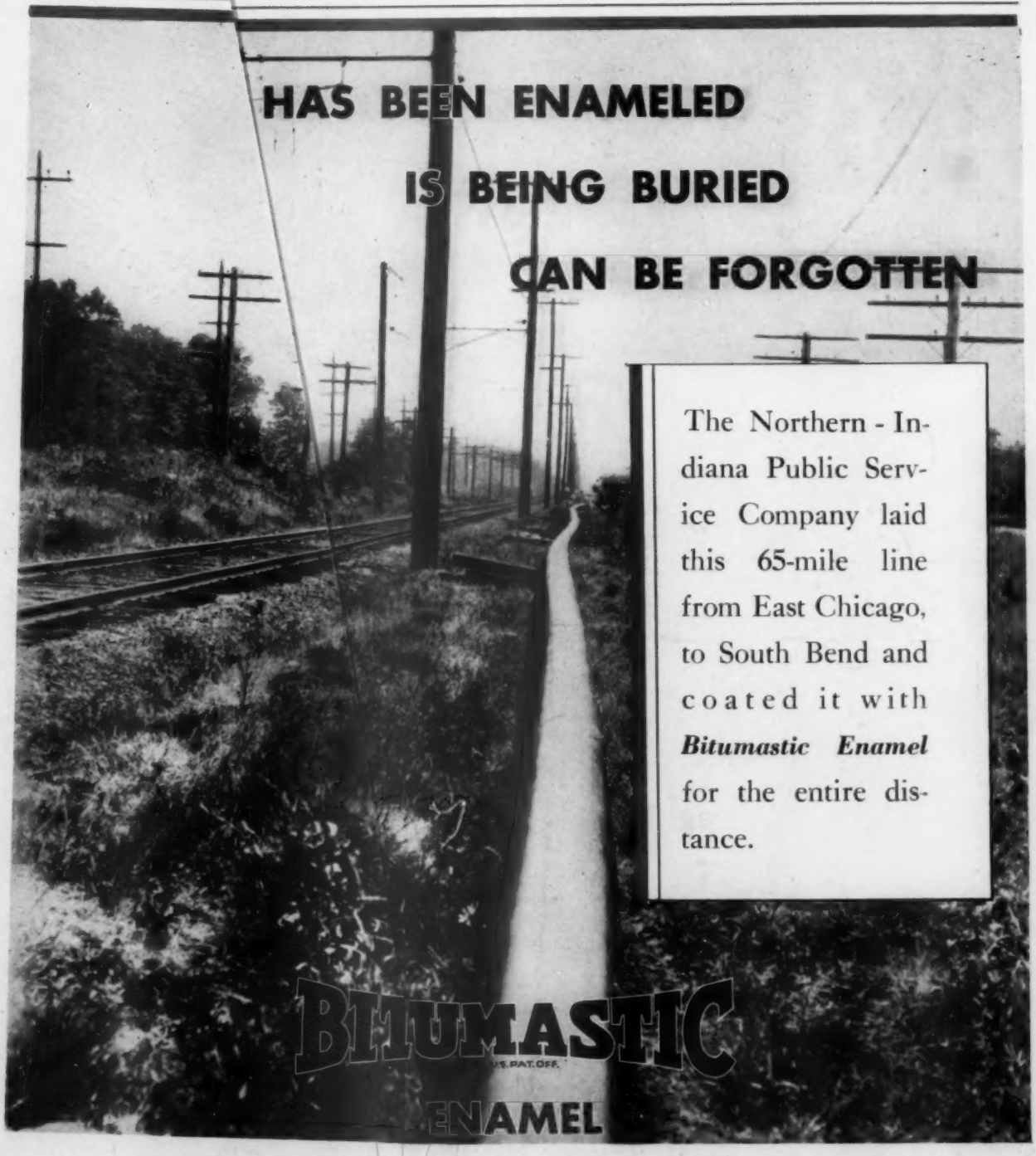

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